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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. DECEMBER 14, 1899. CHICAGO, ILL. NUMBER 50

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. DECEMBER 14, 1899. CHICAGO, ILL. NUMBER 50

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Sales of the old-range Bessemer ores of Lake Superior began on Monday of this week. While it is not to be expected that the scramble of last spring, when prices were about $2.50 a ton lower, will be repeated, large contracts have been entered into in the past few days, and in the case of some large producers the bulk of their output for 1900 has been sold. Mesabi Bessemers, as predicted, did not follow the lead of Biwabik at $4.25, but have sold on a basis of $4.80 for Fayal. Eastern furnaces have been in the market, but as heretofore are rather letting Central Western buyers set the pace. Imports of Cuban and other foreign ores will be on an enlarged scale next year, but even with 250,000 tons from Cuba and 200,000 tons from Newfoundland, and increased shipments of low phosphorus ores from Mediterranean ports, the total will be but a fraction of the wants of the East, apart from its local ores. Furnacemen who had intimated that ores could be had from other than Lake Superior sources at 1 cent a unit below the price fixed for lake ores, have been buyers in the Cleveland market the past week, though not for a full 12 months' supply. The scale of ore buying thus far, in the iron market's quietest month of the year, is taken to indicate the general confidence in the continuance of substantially the prices of to-day for pig iron and steel. Some effort has been made to gauge the condition of the foundry trade and its outlook. Reports show that stocks of pig iron in foundry yards are light, that foundries see indications of an increase rather than a decrease in their business in 1900, at high-level prices, and that large requirements of foundry iron for the first half of 1900 are yet to be met. Production of pig iron is increasing with each month, but calculations of output of newly started old furnaces have been disappointed in a good many cases, and promised deliveries based on estimated production may show some defaults. A factor that will be more in evidence next year is stoppages for repairs, many furnaces having been driven this year to their utmost, and relining and repairs postponed, to take advantage of rising prices. When high-priced raw materials come in, and profits are lessened, shut-downs can be better afforded; and in many cases they will come because they cannot be put off. The week has brought no changes in prices and the indications are that the quiet period of the year will be marked by neither advance nor decline. The fact that the leading consumers of iron and steel—railroads, car works, ship yards, bridge and structural works, are supplied with work for so many months of the new year, is taken as an indication that expectations of any general weakening in prices due to the lull in new buying will not be realized.

PITTSBURG.

OFFICE OF *The Iron Trade Review*.
705 PUBLICATION BUILDING, Dec. 13.

The iron and steel market has relapsed into a state of decided dullness. The condition is no different from what should be expected in December, but following upon a period of such unwonted activity there are many who seem to think that the dullness is out of place. The market is being held steadily because there are now in the trade forces which can exercise a control which in former times was lacking, and the developments which are taken as signs of weakness are all of a negative character. Nothing positive has occurred to presage a general break, and the absence of demand may by the easiest transition be replaced by decided activity which will at once wipe out the impression created in the past two or three weeks.

The most marked change which has come over the market in the past month or two is in the relation of prices for near and future delivery. Two months ago much higher prices for prompt delivery were the rule; now many prices made for quick shipment are made where contracts covering the first half of next year would be refused at the same figures. This is particularly the case with plates and sheets. It is not true of Bessemer pig iron, while with billets and coordinate products prices are about the same for near as future delivery.

Price changes during the week have been unimportant. Bessemer pig iron is strong at former figures, while there is practically no market in billets, and sheet bars are firm at $36 to $37. In steel bars the market is fully as strong as it was, while sheets are fully as weak as they were. In plates prices for nearby deliveries are unchanged, but for later deliveries the mills are showing signs of stiffening and in the course of a week or two higher plate prices may be seen. As spelter has advanced, it is likely that galvanized sheets will take an upward turn.

The resignation of Mr. Frick as chairman of the board of managers of the Carnegie Steel Co., Ltd., announced last week, has been discussed with a great deal of interest, and has given rise to a great deal of idle speculation as to his plans for the future. It can be predicated with certainty that the stories which have been going the rounds are only guesses. It is learned on the best authority that the five-sixths interest in the Oliver Iron Mining Co. is irrevocably tied up with the Carnegie interests, while the ore arising out of the Oliver one-sixth has been sold to the National Steel Co. for a term of 20 years. Thus it is certain that whatever project is on foot cannot be based on any of the Carnegie-Oliver ore holdings. It is probable that something definite in regard to the real scope and purpose of the Union Steel Co. will come out from an authoritative source within a week or two, and it is probable further that Mr. Frick's name will be connected with it, but nevertheless it is claimed that Mr. Frick's pecuniary interest in the Carnegie Steel Co. will not terminate in any event until the company is reorganized in 1901. At the present time, however, some changes in the personnel of the management of the company are being arranged, and their announcement in the near future cannot but be received with great interest.

The Western Pennsylvania and Eastern Ohio Freight Traffic Association at a meeting yesterday, referred to elsewhere, advanced coke rates, taking effect Jan. 1, from 55 to 70 cents to Pittsburg, from $1.10 to $1.20 to the valley, and from $1.40 to $1.50 to Cleveland. In limestone an advance of 5 cents was made. An advance in the ore rate effective May 1, is under consideration.

PIG IRON.—The situation in Bessemer continues very strong. About 10,000 tons have been sold for delivery before April 1, and another block, which will fully clean up all the available Bessemer for the first half, is under negotiation and part has been sold. The price is very firm at $24, for the first half of next year, or $24.90, Pittsburg. Third quarter iron has been sold to a limited extent, but there is less interest in this delivery. Meanwhile the time to the third quarter is lessening and when furnaces are called upon for third quarter iron it may well be that they will get better prices than had they sold more during the past month. In foundry

and gray forge the situation is strong, but unchanged. We quote prices as follows for first half of next year, but except in the case of Bessemer these prices could probably also be done for December:

Bessemer, valley furnace	$24.00 to	$24 25
Bessemer, Pittsburg	24.90 to	25.15
No. 1 Foundry	23.75 to	24.00
No. 2 Foundry	23.00 to	23.25
No. 3 Foundry	22.25 to	22.50
Gray Forge, valley furnace	20.50 to	21.00
Gray Forge, Pittsburg	21.00 to	21.50

STEEL.—There is very little doing in steel billets, as there is not much inquiry. The billet market has so narrowed down, as has so often been predicted in this column, that it is frequently the case that there is really no market price. The bulk of the tonnage which still changes ownership goes to so few interests its sale is surrounded by special conditions. We quote Bessemer billets at about $35 maker's mill, for either near or forward delivery. Open-hearth billets are unchanged at $45. Prices on sheet bars are very firm at from $36 to $37, and it is understood that nothing can be done below the lower of these figures in any case.

FERRO-MANGANESE.—We quote domestic 80 per cent ferro unchanged at $100.

RAILS AND TRACK MATERIAL.—The rail market is rather quiet. In track material there continues to be a fair demand. Prices remain as formerly quoted on rails and track material as follows: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25-pound, and less than 50-pound, $37, all f. o. b. mill, Pittsburg; track material — Spikes, 2.50c; track bolts, square heads, 3.60c; hexagon heads, 3.85c; splice bars 2.50c to 2.60c; links and pins, 3c to 10c.

BARS.—The market for steel bars is strong but not very active. Nothing below 2.25c can be done in this district, for good orders and desirable delivery, while for small lots and quick shipment higher prices are obtained, up to 2.35c or 2.40c. The Western market is scarcely on a parity with the Pittsburg market and prices made there are being met by Pennsylvania mills. The minimum which can be done at Chicago is understood to be 2.35c, and as the freight is 18c, this is below the parity. Iron bars from all muck stock are a trifle higher than steel bars.

STRUCTURAL MATRIAL.—No meeting of the beam pool has yet been called, but it is expected one will be held in a short time. There is no likelihood of a change of prices either way and the present proportions in the various lines hold together very well so that no re-adjustment of prices in any way is expected. There continues to be a fair inquiry for the season, and prices remain as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates, 2.50c to 2.75c, according to delivery and size of order.

PIPES AND TUBES.—There is nothing new to report in this line. Demand, both foreign and domestic, keeps up very well for the season. We repeat former quotations as follows: Merchant pipe, 50 and two 10's for car-loads delivered within the specified territory; well casing, screw and socket joint, 37½; inserted joint, 32½, with an optional 5 per cent to dealers only; boiler tubes 1¼-inch to 1½-inch, 40 per cent off; 1¾-inch to 2½-inch, 50 per cent off for iron, and 55 per cent off for steel; 2¾-inch and larger, 52½ per cent off for iron and 55 per cent off for steel, with 5 per cent additional in carloads, less than carloads being f. o. b. mill.

PLATES.—The plate market is still decidedly weak, and offerings are being made at considerably lower figure than some mills would accept. Prices for delivery in some districts are better held than for delivery in others. A slight tendency to stiffen on prices for late delivery is being noticed, and if this becomes more pronounced the present unsatisfactory state may be lived out. It is generally recognized that plates are too low in consonance with other lines. For the present we quote prices unchanged as follows for either prompt or next year's delivery: Tank plate, under say 50 inches in width, 2.40c; over 50 inches, 2.50c; very wide plates, 2.60c; shell steel, 2.60c to 2.70c; flange 2.70c to 2.80c; and fire box 3¼c to 4c.

SHEETS.—The sheet market continues to be the most unsatisfactory in the list of finished material. But the low prices are generally admitted to be due to the existence of some low contracts which had to be worked off on sheet bars, and therefore there should be an improvement, as the sheet bar mills have only a few thousand tons of bars on their books now which were sold at really low prices. Some contracts have lapsed because the sheet mills could not take the steel. We quote No. 28 gauge sheets one pass through cold rolls, unchanged at 2.95c to 3c, and the lower of these prices could not be shaded materially, except on a very desirable specification. Galvanized sheets continue at 75 and 5 to 75 and 10 off with a 15-cent freight allowance, but as spelter is higher there may be an improvement in prices for galvanized sheets. The price has only about 25 per cent to fall to meet the lowest price on record, about 80, 10 and 5.

SPELTER.—The market in spelter is considerably stronger, and we quote prime Western grades at 4.70c to 4.75c, Pittsburg. This is an advance of about $6 a ton since last week.

OLD MATERIAL.—This market is rather dull, and prices are irregular, but are not quotably changed from last week. We quote as follows, Pittsburg, gross tons, except where otherwise specified: New Bessemer melting stock, $26 to $27; basic open-hearth scrap, $28 to $30; steel rails, mixed lengths, $22 to $23; short lengths, $23 to $24; iron rails, $29 to $31; cast borings, $14 to $15, net tons; cast scrap, $18 to $20; No. 1 wrought scrap, $24 to $25, net tons; busheling scrap, $16 to $18, net tons.

COKE.—The coke market is rather quiet, but there is a good tonnage of foundry changing hands for next year. Production keeps up at a very strong pace. We have already noted the advances in coke freight rates, to go into effect Jan. 1. The advances range from 10c to the valleys and Cleveland to 25c to Chicago, but there has been no objection on the part of the trade as conditions fully warrant the advance. We quote standard Connellsville furnace coke at $2.75 to $3 for furnace and $3 for foundry.

CHICAGO.

Office of The Iron Trade Review,
1522 MONADNOCK BLOCK, Dec. 13.

The general situation has changed very little in the week. The sales of iron and steel were not heavy, and are not expected to be large before Jan. 1. Sellers geerally are looking for a considerable buying movement within a short time after the first of the year, and predict higher prices on some classes of material as soon as it comes.

PIG IRON.—Nearly all the business closed last week was of the small order variety. The demand is entirely in lots of 500 tons or less, and is not likely to increase this month to any extent. There are some inquiries in the market for larger quantities, but buyers state that they will not make purchases until some time in January, after the annual stock taking. Furnace agents seem to be very firm in the belief that prices will be higher, if any changes are made, after the January buying commences. Such iron as can be had for immediate delivery sells for quite a little advance over the quoted prices, and as a matter of fact there is very little iron for prompt shipment to be found. Furnaces are nearly all sold up for the first six months of next year on some grades and several furnaces have absolutely no iron for delivery before July 1. Foundries continue to run full, and are pressing furnaces hard for shipments on old contracts. The shortage of cars has delayed the furnaces in many cases. There have been no changes in quotations in the week:

Lake Sup. Charcoal	$25 50 @$26 50	Southern Coke No. 3	$21 00 @$22 00
Local Coke Fdy. No. 1	25 00 @ 25 50	Southern No. 1 Soft	23 00 @ 24 00
Local Coke Fdy. No. 2	24 50 @ 25 00	Southern No. 2 Soft	22 00 @ 23 00
Local Coke Fdy. No. 3	24 00 @ 24 50	Southern Silveries	26 50 @ 27 00
Local Scotch Fdy. No. 1	25 00 @ 25 50	Jackson Co. Silveries	32 00 @ 32 50
Local Scotch Fdy. No. 2	24 50 @ 25 00	Ohio Strong Softeners	24 50 @ 25 00
Local Scotch Fdy. No. 3	24 00 @ 24 50	Alabama Car Wheel	24 00 @ 26 00
Southern Coke No. 1	23 00 @ 24 00	Malleable Bessemer	24 00 @ 25 00
Southern Coke No. 2	22 00 @ 23 00	Coke Bessemer	25 00 @ 26 00

BARS.—Sales were not especially large last week, although they include several quite good sized contracts. The demand is not heavy just at present, but mills are looking for increased sales shortly after Jan. 1. The market is firm and quiet at 2.35c to 2.50c for both common iron and steel, half extras, Chicago delivery.

STRUCTURAL MATERIAL.—No contracts of importance are in sight for the immediate future. Small lot business was very fair last week, considering the season. Quotations are as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches 2.40c; sheared plates, 2.90c

to 3.15c; universal plates, 2.80c to3c; tees 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—Some business has been done in small lots, but there is not much immediate demand for heavy business. What large inquiries have been received will hardly be placed until after the first of the year, when buying is expected to increase materially. Light plates have stiffened materially, some houses having withdrawn quotations. No advances have been made as yet, however. Tank steel from store, 3.10c to 3 25c. Mill shipments, Chicago delivery: Tank steel, 2.90c; shell, 3.10c; flange, 3.25c; marine 3.30c; fire box, 4c to 6c, according to brand.

MERCHANT STEEL.—Dealers are not expecting any change from the quietness of the past few weeks until ater the first of the year. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

MERCHANT PIPE.—Sales were somewhat smaller last week than in the week previous, and did not include any large orders. No very heavy business is looked for in the balance of this month. Prices are unchanged at 50 and two 10's off for mill shipment on large orders, and 50 and 10 and 5 off on small orders.

SHEETS.—There is a somewhat better inquiry for both black and galvanized sheets, and some buyers have asked for prices on considerable quantities. Dealers do not expect, however, that much buying will be done this month. The market is still low, but seems to have settled on bottom, as prices are very firm and the quotations of 3c to 3 15c for No. 27 black, and 75 and 5 to 75 and 7½ per cent off for galvanized.

BILLETS AND RODS.—There is considerable demand for steel, but requirements have had to be satisfied from outside mills, as the local mills can accept no business, being so far sold ahead. The market is unchanged at about $37 for Bessemer billets, $40 to $41 for open-hearth billets, and $55 for Bessemer and $65 for open-hearth rods.

RAILS AND TRACK SUPPLIES.—Sales have been only in small lots. There is a considerable demand for this class of business, but no large orders have been placed. Quotations are as follows: Rails, standard sections, $35 to $38; light sections, $37 to $42; splice bars, 2.50c to 2 70c; spikes, 2.75c to 2 85c; track bolts, 3 65c to 3.85c.

WIRE AND WIRE NAILS.—There is no change in the situation. Jobbers are still refraining from large purchases, and will hardly do so before the first of next month. The demand from the general trade is good. Makers quote single carloads of wire nails at $3.25 f. o. b. Chicago, and $3.35 for less than carloads. On wire current quotations are as follows: Plain annealed wire, $3.10; painted barb wire, $3 70; galvanized barb wire, $3 85.

OLD MATERIAL.—The past week's sales were limited to small lots in almost every case. Buyers are still anxious to secure steel scrap, and this class of material is in the greatest demand at present. Dealers' selling prices are about as follows:

Old iron rails, gross,	$31 00@$32 00	Country malleable	$15 00@$16 00
Old steel rails, long, gr.	24 50@ 25 50	Iron axles, net	31 00@32 00
Old steel rails, mixed	20 50@ 21 50	Cast borings, net	10 00@11 00
Relaying rails, gross	30 00@ 31 00	Wrought turnings, net	14 00@14 50
Old wheels, gross	23 50	Iron axle turnings, net	16 00@16 50
Railroad forge, net	25 00@ 26 00	Steel axle turnings	15 00
Dealer's forge, net	19 00@ 21 00	Mixed country steel, gr	15 00
No. 1 cut mill, net	16 00@ 17 00	Stove plates, net	11 50@12 00
Heavy cast, net	16 00@ 17 00	Heavy melting steel, gr	20 00@21 00
Railway malleable, net	17 00	Old iron splice b., net	27 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
27 VINCENT ST., Dec. 13.

The sale of old range Lake Superior ores opened Monday morning and large contracts have been closed for the 35 or 40 per cent of the product of next year going upon the market. Some of the favorite ores that have been taken up first, in other years, have disappeared from the selling list, being now consumed by interests that have acquired the properties in the past year. Notable in this list are the Chapin, Aurora and Lake Superior. It would appear that some buyers who announced a few weeks ago that they would not enter the market if the prices then under discussion were fixed seem to have reconsidered their determination. Requisitions have been in the offices of the ore selling firms for some time, for large blocks of ore, and for the most part the sales of the week have involved the parceling out of what can be produced and the drawing of contracts. As was the case when the sales for 1899 were made the buyer has sought the seller. In some instances where prospective purchasers have not promptly closed for the ores they had spoken for, notifications have been given them that others stand ready to take the material, and that an early decision must be made. Cases are known in which 90 per cent of the estimated production for 1900 has been disposed of already. The demand from the East has been good, but as heretofore that section is waiting to see how the Central West takes hold. As indicating how the well known ores line up from the $5.50 base we quote prices as follows: Chandler, $5 99; crushed Champion No. 1, $5.93; Republic No. 1, $6.48; Kingston, $6.11; Republic special, $6.87; Montreal, $5.89; Grenada, $5.30; Lake Bessemer, $5.45; Iron Belt, $5.16; Newport, $5.75; Lawrence (from Montreal mine), $5.25. Chapin ore (which this year is Chapin and Rex combined) is listed at $4.96, but there is none on the market. Among non-Bessemers the price on Vermillion ore is $5.10; Lake (Cleveland-Cliffs), $4; Salisbury, $4; Cliffs Shaft, $4.65. The high-phosphorus non-Bessemers of the Menominee range sell at $4.05. The Mesabi Bessemers have had a fair initial sale, the price being on the basis of $4.80 for Fayal. It is understood that the Biwabik ore recently sold at $4.25 is ore that will be mined in connecting the east and west cuts of the property, and that it runs from .040 to .050 in phosphorus.

The navigation season is drawing rapidly to a close. The last ore cargoes left Two Harbors on Tuesday. A record of 41,000 tons in 24 hours loading was made at this dock the past week. Escanaba shipments are expected to run through the week, and if conditions permit ore may be loaded from that port up to the close of next week.

PIG IRON.—The last of the estimated production of Bessemer iron in the valleys in the first half of 1900 is now reported sold at $24 in the valley, or $24.90, Pittsburg, the new freight rate of 90 cents going into effect at the beginning of the year. As noted elsewhere, advanced freights in coke and limestone go into effect Jan. 1, and it is probable that a higher ore rate will become effective next season. Foundry and forge irons hold their prices firmly, in a quiet market. The foundry iron market, despite the absence of large transactions, has not been inactive. Sales of Southern grades have been going on steadily since Dec. 1, the pace being equal to that of November. The range of purchases is in general from 100 to 500 tons. Lake Superior charcoal iron is sold well into next year, some furnaces having disposed of half their product for the second six months. We quote:

Bessemer	$24 90	Valley Scotch No. 1	$23 00@23 50
No. 1 Strong Foundry	23 00@ 23 50	Valley Scotch No. 2	22 50@23 50
No. 2 Strong Foundry	22 50@ 23 00	Gray Forge, valley	21 00
No. 3 Foundry	21 50@ 22 00	Lake Superior Charcoal	25 00@26 00

FINISHED MATERIAL.—A quiet market is noted in every descripton of rolled products. There seems a slight reaction from the lowest prices on sheets and some mills are now $2 a ton above their lowest quotation, making 3c at mill for No. 28 their minimum. Specifications come in at a steady pace but new business in most lines awaits developments in the new year. The possibility of a slight advance in structural material at the next meeting of the beam association is discussed. Plates are unchanged, and weak sellers are still in evidence. We quote tank plates at 2.55c to 2.60c, Cleveland, with reasonably prompt delivery. Some mills ask higher prices. Bar iron is unchanged at 2.15c base, valley mill, or 2.30c for assorted sizes, cut to length. A remnant of stock in a jobber's hands on which a lower figure was quoted is no longer in evidence.

OLD MATERIAL.—There is a more active market for foundry than for small mill scrap at the moment. We quote No. 1 railroad wrought scrap at $24 to $25, mill; machinery cast scrap, at $17 to $17.50, Cleveland; iron axles, $28; wrought turnings, $14; cast borings, $12 to $13.

CINCINNATI.

Dec 12.

Reviewing the pig iron market for the past week, Rogers, Brown & Co. say that it has been characterized by a steady run of orders, well distributed as to brands and grades, at current prices. "There has been the usual number of small orders for quick delivery, interspersed with a few for round lots for shipment during first half of next year. The market is in a very healthy condition, devoid of any excitement, and

it seems to be satisfactory to both producer and consumer The customary reports have been received of a number of furnaces whose starting is delayed on account of scarcity of raw material, and some of those that started in haste without due preparation are now repenting at their leisure. It is thought by those well informed that the increase in production of foundry iron during the first half of next year will be limited and that the increase of capacity of foundries is more than sufficient to absorb it. It is hoped that the buying for the next two or three months will be confined to legitimate purchases and that the attempts to create a speculative demand may fail. The efforts of those who have been trying to give the impression of a slump in prices for later delivery for making fictitious quotations on warrant iron for the last half of next year, have met with success. No prudent man who is financially responsible would dare to sell short at a time when consumption is in excess of both present and prospective output."

Matthew Addy & Co. write: "While there is no question that the market is quieter than it has been, at the same time there is an under current of great strength, and all the time big buyers are slipping in quietly and taking what they can find. Thus far the December tonnage has been fully up to the business that was done during the same time in November. Prices are steady and concessions are out of the question. Small orders come in regularly with every now and then the larger orders referred to above. It must be noted, however, that a number of large buyers who have tried to contract for round lots for reasonably early delivery have been absolutely turned down, that is, they have not been able to find the iron. Just now, a good many customers report that they intend to go into the market after the first of the year. If half of the consumers who announce their intention of doing this really buy iron, January will be a decidedly lively month. The car situation in the South is somewhat better, yet much is still desired."

We quote for cash f. o. b. Cincinnati: Southern coke No. 1 foundry, $21.75 to $22.25; Southern coke No. 2 foundry, $20.75 to $21.25; No. 3 foundry, $19.75 to $20.25; No. 4 and gray forge, $19.25 to $19.75; No. 1 soft, $21.75 to $22.25; No. 2 soft, $20.75 to $21.25; Lake Superior coke, No. 1, $24 to $24.50; No. 2, $23.50 to $24; Hanging Rock charcoal, No. 1, $25 to $26; Jackson county silvery, No. 1, $30 to $31; standard Georgia car wheel, $24.75 to $25.75; Lake Superior charcoal, $25.50 to $26.

PHILADELPHIA.

Dec. 12.

Prices of pig iron and of rolled material stand substantially at the level of last week. Foundry buying has been generally in small lots. There is evidence that it would be heavy if assurance could be given that an advance will come in the next two months, or even that the present level will be strongly maintained; for indications are not lacking that the consumption of foundry iron will be kept up steadily and may even increase, in spite of the high level of prices. All large foundries have work in hand that will occupy them for months and are figuring on as large a scale of operations, and often larger, in the coming year. It is the lack of entire ananimity as to the course of pig iron production, and its relation to consumption, that causes waiting in some quarters, and purchases for only the early future in others. Mill iron has been bought in 1,000-ton lots in the past week by mills in Central and Eastern Pennsylvania. It is reported in some of these cases a more open iron has been stipulated by the furnaces, in view of the scarcity of forge iron for December shipment, and buyers have accepted it. Large orders for charcoal iron have been booked of late, car wheel works being exceedingly busy. On some recent quotations on pig iron buyers who have held off are asking a revision, but it does not appear that any concession is being made. We quote $25 to $25.25 on No. 1 foundry iron, $23.50 to $24.50 on No. 2X foundry and $22.25 to $22.75 on No. 2 plain; gray forge, standard brands, $20.50 to $21. There has been considerable figuring on steel, but buyer and seller do not get together Less likelihood of lower figures appears now, mills quoting $38 firmly, muck bar is nominally $31 at mill and nothing doing. Plates seem to be in good demand for early shipment and mills are able to take care of such business promptly. Prices are easier and we quote 2.55c to 2.65c for tank steel. Bars are a trifle lower, but there is good prospect for business for next year and some considerable contracts have been taken. Prices promise to be at a stand through the quiet weeks about the close of the year. We quote angles and beams and channels at 2.40c to 2 60c, according to size. Sheets are quoted 3.25c for No. 27 and 3.30c to 3.40c for No. 28, with demand only moderate. Old material shows fairly steady prices for the low-priced lines, but the higher priced materials are $2 to $3 a ton lower than the November asking prices. We quote: Choice railroad scrap, $25 to $27; No. 1 yard scrap, $21 to $22; No. 2 light scrap, $15 to $16; machinery cast, $18 to $19; heavy steel scrap, $21 to $22; old iron rails, $27 to $29; old steel rails, $22.50 to $23.50; wrought turnings, $15.75 to $16.25; cast borings, $14.50 to $15; old car wheels, $22 to $23; iron axles, $28 to $29; steel axles, $28 to $29.

PERSONAL.

Howard Seltzer, of Cleveland, purchasing agent of the Shelby Steel Tube Co., has resigned to enter the hardware firm of Seltzer & Steele at Shelby, O.

A. H. Carpenter, vice-president of the Acme Machinery Co., Cleveland, sails for Europe this month. He will spend a year abroad, and during the Paris Exposition will be in charge of the exhibit of his company, whose European trade in bolt making machinery has greatly increased.

Joseph A. Durfee has been made superintendent of the open-hearth department of the Otis Steel Co., Cleveland, succeeding S. B. Sheldon, who resigned recently. Mr. Durfee is succeeded as chemist of the company by Arthur W. Taylor, heretofore his assistant.

E. E. Knapp, of Chester, Pa., formerly with the Tidewater Steel Co., has accepted the position of superintendent of the blast furnaces of the E. & G. Brooke Iron Co., of Birdsboro, Pa.

The name of W. E. Reis, president of the National Steel Co., is borne by the new steel steamer of the Mitchell fleet launched Dec. 9. The vessel is a counterpart of the H. C. Frick and M. A. Hanna.

John O'Donovan, formerly with the Carnegie Steel Co., Ltd., has been appointed manager of the works of the American Steel Casting Co., at Sharon, Pa.

F. M. Grammer, formerly with the Duquesne furnace plant and later with the Lackawanna Iron & Steel Co., at Lebanon, Pa., has resigned to become manager of the blast furnaces of the Colorado Fuel & Iron Co., at Pueblo, Col.

John W. Galvin, superintendent of the open-hearth department of the Illinois Steel Co., has resigned to take charge of the new plant of the Peru Steel Casting Co., Peru, Ind. John E. Galvin, his son, who has been night superintendent at the South Chicago works, goes with him as assistant superintendent.

F. A. Bates, who is a director of the Cuban Steel Ore Co, has gone to Santiago de Cuba on an iron mining commission.

J. H. Cremer of Cremer & Bicknell, chemists and metallurgists, has sailed for Europe for his annual winter's stay in Belgium. He will visit Belgian and German iron and steel works. Mr. Bicknell will sail within a month for a European tour.

Mowry Bates, formerly connected with the Standard Ore Co.'s property on the Mesabi range, has gone to Cuba to conduct explorations on the Sigua Iron Co. properties.

THE Cincinnati Corrugating Co., Piqua, O., has just issued a new and handsome map of the South African Republic, Orange Free State and Cape Colony, the seat of the war between England and the Boers. The map is printed in colors, and is complete in details, thoroughly revised and up-to-date, showing all the points of interest in the war. The company will mail a copy ready for hanging to any requesting it.

THE American Steel & Wire Co. has broken ground on Neville Island, near Pittsburg, for the large plant which it will ultimately erect there, as already noted in these columns. The work begins by starting the erection of a blast furnace, and the entire works, which will embrace blast furnaces, steel works and wire rod and wire mills, will cost something in the neighborhood of $6,000,000.

THE WEEK IN IRON AND STEEL STOCKS.

Denison, Prior & Co. say in their weekly letter on the iron and steel stocks: "The week has been a hard one on industrials. The work of months has been effaced by the efforts of a moment. Earnings, statements and prospects have been thrown to the wind. Common stocks have been ruthlessly slaughtered and are now on the black list of money lenders. The banks at present positively refuse to make loans on non-dividend paying industrials; not that they love them less but that they love bonds more. Common stocks have been unloaded at a very rapid rate by commission houses whose customers were unable to take up and pay cash for their holdings and as the supply was in excess of the demand quotations suffered.

"The New York banks are afflicted with an intermittant fever of discrimination, violent attacks coming at intervals of six months. After the turn of the year money will become easier. This ease will act as a tone to the fever-stricken banks. They will discover again that a few industrials will not seriously injure their health. Bull points will be freely circulated. Quotations will again have a rising tendency; and the events of the past week will have passed into history.

"The preferred issues of the steel companies suffered, but far less than did the common shares. As we have remarked before, these preferred shares are a purchase for either investment or speculation on all reactions."

Fluctuations of the Week and the Year.

The following table shows the fluctuations in iron and steel stocks for the week ending Dec. 11:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy.....	16½	16½	13	14	27⅞	May 25	13	Dec. 11
Am. Car & Fdy pr.	62	62½	57½	58	68¾	Sept. 7	56¾	June 16
Am. Steel & Wire..	49½	49½	36½	39	72	May 4	36½	Dec. 11
AmSteel & Wire pr	95¼	95¼	85¾	89½	106¾	Mar. 13	85¾	Dec. 11
Am. Steel Hoop.....	47½	47½	40	41¾	48¾	Nov. 29	24	May 24
Am. Steel Hoop pr	84½	84½	77⅞	80	86¼	Sept. 14	70	May 13
Am. Tin Plate.....	33⅛	33⅜	20	25¼	52¾	April 4	20	Dec. 11
Am. Tin Plate pr..	83	83	74¼	76	99⅛	Feb. 8	74¼	Dec. 11
Col. Fuel & Iron...	55¼	56	43	45⅞	64	Sept. 11	30⅛	Feb. 8
Federal Steel.....	62¾	63¼	53⅛	56	75	Apr. 3	46⅜	Feb. 8
Federal Steel pr....	82	82	76	77¼	93¼	April 3	72⅛	May 13
National Steel.....	48	48	37	38½	63	April 24	37	Dec. 11
National Steel pr..	94	94	89	89¼	99⅜	Aug. 11	85	May 15
Pressed Steel Car..	58¾	58¾	53	54	61	Aug. 14	44¾	June 1
PressedSteelCar pr	89¾	89½	84¼	84¼	91	Sept. 7	78	May 25
Republic Steel	25⅛	25½	18	20	33⅞	Sept. 6	18	Dec. 11
Republic Steel pr..	70¾	70¾	66	66⅛	79	Aug. 29	66	Dec. 11
Tenn. Coal & Iron	114	114	83	91	126	Sept 11	36	Jan. 14

Notes.

Bearing on the discussion concerning a dividend on the Pressed Steel Car Co.'s common stock at the end of the year it is stated that earnings, as officially announced for the first nine months of this year, indicated net earnings at the rate of $2,308,000 a year, which would leave after paying 7 per cent dividends on preferred stock (or $875,000), a surplus of nearly $1,500,000. The net earnings for the last three months of the year would be at a greater rate, in view of the increased capacity of the plant.

The dividend of 1¼ per cent on the preferred stock of the Pennsylvania Steel Co. is payable in cash Jan. 15 to stock of record Dec. 30.

The directors of the Federal Steel Co. at their meeting in New York Dec. 12, declared a dividend of 3 per cent on the preferred stock, thus making the full 6 per cent for the year, and clearing the way for promised dividends on the common.

Shipments of ore have ceased from the Duluth docks of the Duluth, Missabe & Northern road, with a total for the year of 3,300,000 gross tons, which is against a total of 2,635,000 tons last year. The Eastern Minnesota is still shipping, and will have a total of about 890,000 tons. This road shipped only 550,000 tons last year. The Duluth & Iron Range has passed a total of 3,900,000 tons, was still shipping on Tuesday. Minnesota's ore shipments for the year will be about 8,000,000 tons.

The Braddock (Pa.) Machine & Mfg. Co. has purchased a plot of land at the corner of Talbot ave. and First st., Braddock, Pa., and will erect a tool works on it.

ADVANCE IN COKE, ORE AND LIMESTONE RATES.

Pittsburg, Dec. 13.—The Western Pennsylvania and Eastern Ohio Freight Traffic Association held an important meeting here yesterday, and a number of important matters were acted upon. As foreshadowed, coke rates have been advanced, to take effect Jan. 1. The new rates will be from the Connellsville region, 70c to Pittsburg, $1.20 to the valleys, $1.50 to Cleveland, and $2.50 to Chicago. These rates make advances of 15c to Pittsburg, 10c to the valleys and to Cleveland, and 25c to Chicago. Limestone rates were advanced 5c all around. A number of changes are being made by transferring articles from commodity rates to the classes, but such changes are delegated to the association of general freight agents. A great deal of interest has been manifested as to the attitude of the railroads in the matter of the ore rate form Lake Erie ports to Pittsburg. The Pittsburg, Bessemer & Lake Erie road established a rate of 98c, and this rate has been met by the other roads, the Pittsburg & Lake Erie in connection with the Erie railroad, and the Lake Shore, the Pittsburg & Western, and the Pennsylvania. The Bessemer road has steadfastly refused to enter the railroad association, and will not consent to an advance in the ore rate. The association's attitude has been that it will not advance the rate unless the Bessemer road does likewise, but matters are so shaping themselves that it may do so, the new rate to take effect May 1, which is regarded technically as the date of the opening of the navigation season. The problem is a complex one, for the reason that the Bessemer road carries only about one-third of the Carnegie ore, the remaining two-thirds being carried by the other three roads. Its down tonnage for this season, consisting entirely of Carnegie ore, will be less than a million and a half tons. Thus the Carnegie interests benefit by their control of the railroad, although the bulk of their ore is carried by other roads, because the Bessemer road's existence has held down rates. At the same time, the other furnaces for which the roads carry ore have been benefitted to the same degree. Mr. Carnegie holds a majority of the railroad stock, but the minority is not held by his partners in the steel company, and this further complicates the problem so far as the steel interest is concerned, because an advance in the rate would not benefit it, but would benefit the minority stockholders in the railroad. On the other hand, if the other roads continue to carry two-thirds of the Carnegie ore, they may well regard themselves in position to advance the rate without the co-operation of the Carnegie road. The advance would be two-thirds as great a disadvantage to the Carnegie furnace interests as to the outside furnace interests.

Theodore Hiertz & Son, Montrose and Park aves., St. Louis, Mo., manufacturers of anti-friction metal, Babbitt metal, solder, etc., and buyers and smelters of ore, dross and metal, report a decided increase in the demand for the materials they manufacture and sell. Their sales of "Nonpareil" anti friction metal were fully one-third larger this year than ever before, and other branches of their business have increased in about the same proportion. The "Nonpareil" anti-friction metal is used in place of nickel and genuine Babbitt metal, and it is claimed it is exceptionally good for machinery bearings. Hiertz & Son have issued a pamphlet descriptive of the metal, in which they make claims regarding its wearing qualities, strength, etc., which seem to be borne out by the testimonials which appear in the same pamphlet. Further information, samples, etc., will be furnished on application to the manufacturers.

On Saturday the Braddock, Pa., works of the American Steel & Wire Co. turned out 405,000 pounds of wire rods. The best previous record in the same time was 401,000 pounds, made at the Joliet plant when it was owned by the Consolidated Steel & Wire Co.

It has been announced that the National Steel Co. has purchased 3,000 acres of coal near Bridgeville, Pa. This deal was closed several weeks ago by the National Mining Co., that will represent the National Steel Co. and American Steel Hoop Co.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

DECEMBER 14, 1899.

AN EVOLUTION NOT A REVOLUTION.

That the consolidation of iron and steel companies is not a revolution, but rather a further evolution of what began years ago in the iron trade is the argument developed editorially in the last issue of the *Bulletin* of the American Iron and Steel Association. In illustration, the Tennessee Coal, Iron & Railroad Co., the Illinois Steel Co., the Carnegie Steel Co and the Lackawanna Iron & Steel Co. are cited, all having been in existence for years, and all formed by the amalgamation of companies already well known. Mr. Swank truly says: "That so many of these corporations have been organized within the last two years gives an excuse for saying that their organization marks a revolution in our iron trade, but looking deeper and further back it would be more correct to refer to these recent creations as indicating high-water mark in an evolution that had its commencement many years ago." After reciting the details of the organization of the four companies, the article says:

All of the four companies mentioned above, not one of which is a recent creation, represents consolidations of previously existing iron and steel enterprises. They represent a tendency in this country to consolidations of manufacturing capital which is not new but old. Unitedly they have recently produced more than one-third of the country's production of the pig iron, more than two-fifths of its production of steel, and more than one half of its production of steel rails. Nobody but a noisy free trader has ever contended that these four companies have ever inordinately advanced the prices of their products or unjustly lowered the wages of labor. On the contrary their very existence, by increasing the production of iron and steel, has tended to lower prices while at the same time increasing the demand for labor. We can imagine no reason whatever why the iron and steel consolidations that have been recently organized should not be operated with precisely the same beneficial results to the country as have characterized the management of the four great companies whose history we have briefly given. Any criticism of these recent consolidations that falsely stigmatizes them as trusts and beats the air for political effect is not only unjust but it is a direct attack on the unexampled prosperity which this country is now enjoying.

Some of the hostile comment on the consolidation tendency in iron and steel manufacture utterly ignores the fact that such large aggregations of capital, controlling all the materials entering into production and all the facilities for manufacture from the ground up, are indispensable to the maintenance and extension of the foreign trade in iron and steel, in which so good a beginning has been made. The very press that for years has been calling for the taking of world markets, is first and loudest in denouncing the use of these new mechanisms that are the very tools of American trade expansion.

ORE IMPORTS AND THE LAKE SUPERIOR SUPPLY.

Dispatches from the East announcing the preparations in the shipping trade for largely increased imports of iron ore next year give an exaggerated idea of what is likely to be realized. The Spanish-American Iron Co., which is the only shipper of iron ores from Cuba at present on any scale, counts on sending 200,000 to 250,000 tons to the United States next year. From Newfoundland mines it is estimated that somewhat less than 200,000 tons will come in. Naturally the imports of Spanish ores and of manganese ores will be increased somewhat. But all told these imports will probably be less than 5 per cent of the Lake Superior production, and therefore are scarcely a factor to be considered in such a time of expansive consumption. The October imports of iron ore reached high-water mark for many months, being 72,931 tons. For the 10 months ending with October there was imported 498,330 tons of ore, against 150,954 tons in the corresponding 10 months of 1898. Of course iron mining operations in New Jersey, the Champlain district, and in Pennsylvania have been stimulated by the revival in iron, and are more and more of a dependence of local furnaces. But the aggregate of all these supplies only emphasizes the position of the Lake Superior ranges as the backbone of the iron industry of the United States. It is entirely within the probabilities that the Mesabi range alone will send to market next year close to 7,500,000 tons.

MOLDERS AND THE MINIMUM WAGE.

The resolution agreed upon by the foundrymen conferees in the recent meeting at Detroit, between committees of the National Founders' Association and the Iron Molders' Union of North America, is as follows:

"*Resolved*, That it is the opinion of this committee of conference, composed of representatives of the National Founders' Association and the Iron Molders' Union of North America, that the principle involved in the establishment of a minimum rate of wages is equitable, and we would recommend its adoption by agreement between the foundrymen and their molders for certain specified periods; provided that such minimum rate of wages is established upon a basis which will not conflict with the business conditions existing at the time such agreement is made; provided, also, that the minimum rate of wages per day so established shall apply only to competent molders who have served an apprenticeship of four years, or had four years' experience at the trade other than on the molding machine, and that compensation for piece-work shall be so established as to allow a workman of average efficiency to earn at least the minimum rate. All workmen employed at molding (except two on the molding machine), not entitled to minimum rate of wages shall, at the end of four years' service, be provided with a certificate

of the National Founders' Association, certifying to such service, and which will thereafter entitle them to the minimum rate of wages."

This was drawn up by the foundrymen in a separate meeting, and submitted to the molders' representatives after the two committees had failed to come to any agreement in joint session. The further discussion of the question showed the molders to be unwilling to make the concession contained in the last sentence of the resolution. The proprietors, as the account of the meeting in the *Iron Molders' Journal* says, then offered to insert at the beginning of the last sentence the words, "until mutually satisfactory arrangements can be made by an efficient apprenticeship system, or otherwise." This was refused on the ground that in accepting the molders would concede the point relating to unskilled labor, for which the proprietors had been contending. The conference adjourned, as we have already noted, without an agreement, and without any proposition from the molders by which practical effect could be given to the provision which they had accepted, as embodied in the resolution, namely, that the minimum rate of wages should "apply only to competent molders who have served an apprenticeship of four years, or had four years' experience at the trade other than on the molding machine." In other words, the union insists that wages may not fall below a certain point, but provides no method by which the employer may pay only for what he gets when labor falls below the limit of skill and experience.

In addition to the large orders for steel rails booked for 1900 a few weeks ago, there have already been taken several good contracts for export. The Russian order for 125,000 tons for the Trans-Siberian road, that was announced some months ago to have been closed by a Central Western will, is still afloat. The price originally named by an Eastern mill, at which it was supposed the bulk of the order had been taken, was finally decided by the Russian officials to be too high. Later in the year, after prices had advanced, they took the matter up and after long negotiations which it was believed by Russian representatives here would terminate in the contract going to Pittsburg, the authorities on the other side again concluded that they could not pay the price. To-day the American bidders are well satisfied with the outcome of the matter; but it must be apparent to the Russian agents that an opportunity that may be long in returning has been let slip. Not only has the price advanced nearly 100 per cent, but the difficulties of financing the deal have greatly increased.

The Iron Trade Circular, of Birmingham has this to say regarding the condition of the iron and steel trade for the week ending Nov. 18: "Notwithstanding the large output of steel rails, makers are quite unable to cope with the demand. The American makers are crowded, so all inquiries are coming to this country. Only recently a Continental buyer of steel rails advertised for about 6,700 tons. Not a single English or American tender was received, the only one being from an Italian firm; and in that case the price quoted was so high that the purchaser has decided to withhold his order until the market is more favorable. He will, no doubt, have to withhold the order for a long time, as the Americans are reported to have sold their entire output for the whole of next year, and British firms are fast filling up their books. Prices have further advanced, as the basis price for heavy rails is now £7 per ton at works. The condition of the steel trade has been illustrated by a Nottingham firm which undertook to supply the Yarmouth Corporation with steel and iron work for a dust destructor. The firm informed the council that five of the principal makers of girders with whom they had been in the habit of doing business had absolutely declined to accept their order, 'on account of the glut of their order books.' Two steel girders that were tendered for at £226 a short time back cannot now be supplied under £438."

The Old Cast Iron Pipe Agreement.

The *Financial Chronicle* says of the agreement of three years ago among the six cast iron pipe companies which was passed upon by the Supreme Court last week: "The 'trust' was in many ways unique. It was a combination made up of six companies situated in four states engaged in the manufacture of iron pipe. The agreement entered into provided for a division of territory among members of the combine and for fixing the prices for the sale of pipe in thirty-six different states. In the other states free competition was permitted; but in the thirty-six the members agreed not to compete with one another. Whenever any municipality, corporation, company or other party advertised for bids for pipe within those states the executive committee of the association met to determine the price at which and the person by whom a bid was to be put in. The concern that agreed to pay the highest bonus to the association was awarded the right. A further provision was that members other than the one to whom the job had been assigned should make fictitious bids above that of the member selected for the work. These are among the salient features of the agreement. The main question before the court was whether such an arrangement violated the United States trust law of 1890. When the case first came up the judge decided that it did not affect interstate commerce, and so rendered judgment for the defendants. In the Circuit Court this judgment was reversed."

At Racine, Wis., 400 molders employed in the plants of J. I. Case Mfg. Co., S. Freeman & Son, and the Racine Malleable & Wrought Iron Co. quit work Dec. 7, and as many more in other plants, it is said, will go out. Failure of the foundrymen's association to recognize the union is the reported cause of the trouble. The demand of the men has been under consideration for some time.

A division of the boats of the Lake Superior Iron Co., in which the Oliver Iron Mining Co. and the Cleveland-Cliffs Iron Co. are interested has been made. There are six steamers in the fleet and the Andaste and Choctaw will hereafter be operated by the Cleveland-Cliffs Iron Co. and the Joliet, La Salle, Wawatam and Griffin will remain in the office of the Oliver Iron Mining Co. The latter company bought three fourths of the stock of the Lake Superior Co. and the Cleveland-Cliffs Iron Co. the balance.

The Cambria Steel Co., of Johnstown, making preparations to build ten large open-hearth furnaces. The plant is to be laid out for an ultimate equipment of 40 furnaces.

The Q. & C. Co., of Chicago, has issued a circular stating that it is not involved in the litigation now pending between various makers of pneumatic tools, and that full protection will be given to buyers of tools made by the company. In addition to pneumatic hammers and riveters, the Q. & C. Co. will shortly put on the market drills, for both wood and metal, and hoists.

The Westinghouse Electric & Mfg. Co. has a contract for half a million dollars' worth of electrical machinery and supplies, for the equipment of the entire traction system of Adelaide, New South Wales, Australia. James O. Callender, of Sydney, Australia, is consulting electrical engineer of the Adelaide Development Co., which recently bought all the tramways of Adelaide, amounting in all to about 54 miles of road.

THE SELLING SIDE OF THE TRADE.

Representatives of Well Known Iron and Steel and Equipment Firms.

We present a portrait of Philip D. Sloan, sales agent of the Garden City Sand Co., of Chicago. He was born in Cleveland, O., July 4, 1866, and his first business experience was in the employ of his father, Edward H. Sloan, who was one of the oldest builders of wooden vessels on the lakes. At 21, the son became connected with the F. W. Wheeler Shipbuilding Co., of West Bay City, Mich., and a year later superintended the building of the largest wooden boat ever built on fresh water. His next connection was with the Vacuum Oil Co., of Rochester, N. Y., whose marine trade he handled with Cleveland as headquarters. In April, 1894, he embarked in the fire clay products trade in Chicago, and

PHILIP D. SLOAN.

built up a good business. His connection with the Garden City Sand Co. began in July, 1897, and he is now general selling agent of the company, with its extensive lines of clay products and sand. Mr. Sloan is the inventor of the Sloan railway spike, which has been well endorsed in railway circles.

ANDREW M. MORELAND, the new member of the board of managers of the Carnegie Steel Co., Ltd., is the youngest man ever elected as a member of the board. Mr. Moreland was born July 23, 1864, in Pittsburg, and was educated in the public schools. At the age of 17 he accepted a position with the American Union Telegraph Co., and remained with it until 1880, when he went to work with the Western Union. He started to work for Carnegie Bros. in 1884. From that time until 1889 he served in several different positions as clerk and bookkeeper. In 1889 he was appointed chief clerk in the accounting department. In 1891 he was promoted to the position of assistant auditor, which he filled until 1895, when Mr. Carnegie appointed him auditor and assistant secretary. In 1896 Mr. Moreland was selected to negotiate the purchase of the Shenango road for the company. Mr. Moreland has been a member of the firm since 1897. There are only nine members of the board including the president, vice-president, secretary and treasurer.

L. K. HIRSCH, 549-551 The Rookery, Chicago, has issued a neat card case, advertising his business as a scrap iron dealer, and handler of old iron and steel rails, especially for relaying.

J. H. MEANS, of Birmingham, formerly with the Sloss Steel & Iron Co., at Birmingham, has succeeded Walter Graham as superintendent of the Virginia Iron, Coal & Coke Co., with headquarters at Bristol, Tenn.

STATUS OF INDUSTRIAL STOCKS.

The performance of the industrial securities, including those of iron and steel consolidations, in Wall Street this week have attracted some comment. As indicating that the condition of an industry is no criterion whatever for the market in stocks of large corporations representing that industry, the events of the week have furnished some food for reflection on the estate to which the iron trade has come. A writer in the *Wall Street Journal* comments as follows on some of the statements that have gone the rounds in the week:

"The principal argument urged against the market in general and the industrials in particular is that the enormous creation of new capital entails a corresponding amount of liquidation. This however, would only be true if the new capital had all been 'floated,' that is, sold to new speculative buyers either in the form of underwriters or the public in general. Even then it would hardly be true unless there had been a large advance in the price of the securities floated, from the original price of issue. Neither of these requirements appears to exist in the situation so far as the market for industrials is concerned.

"In the first place the largest proportion of the new industrial capital was never floated at all in the strict sense of the word. The public never made a boom in new industrials and very few of them were purchased in any quantity by outsiders. It is true that all the large combinations were underwritten at the time of their flotation, but it is also true that the 'vendors' themselves underwrote a very large proportion of the new capital. Investigation goes to show that while local trust companies and bankers formed underwriting syndicates, and joined in them in greater or less degree, the bulk of the burden was borne by the 'vendors' of the properties taken over by the new companies The effect of this is that the actual changes of ownership of the properties represented by the great industrial companies have been much smaller than many people think or affect to think. The public (including the bankers and trust companies) is probably a much smaller partner in these enterprises than has been alleged.

"Furthermore, there has been no general boom in new industrials. Most of them have never sold above their issue price and have since declined steadily with relatively small transactions. No position of extreme speculative weakness has consequently been created, for there has been no speculation in most of them. In what then are these new industrials a direct menace to the speculative situation? It is true that in certain of the older-established concerns, and in one or two of the new concerns (*e. g.* Federal Steel, Steel & Wire, etc.), there has been at times a big speculation, but in these stocks there has been and always is a reasonably broad market and public ownership is well scattered. In stocks like Tobacco there has been no doubt an immense marking up of values by a concentrated group of interests, and here the decline is not surprising. But can the 'industrials' as a whole be said to be a great menace to the market, considering the circumstances of their ownership? And if so, why?"

THE total value of mineral products of the United States for 1880–1898 is given by the U. S. Geological Survey, with a tabular statement of the amount of each product for the years 1889–1898, inclusive. As showing the growth in these industries, the values for the last two census years and for 1898 are given, as follows:

	1880.	1890.	1898.
Metallic products . .	$190,039,865	$305,735,670	$343,400,907
Non-metallic " . .	173,279,135	312,776,503	353,419,765
Unspecified	6,000,000	1,000,000	1,000,000
Totals	$369,319,000	$619,512,173	$697,820,720

The metallic products include pig iron, silver, gold, copper, lead, zinc, etc. The non-metallic include coal, stone, petroleum, natural gas, cement, phosphate rock, limestone, clay, etc.

WHEN the National Steel Co., the American Tin Plate Co., and the American Steel Hoop Co. remove their headquarters soon after January 1 from Chicago to New York they will occupy offices taking up two floors of the new Park Row building.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

Impact Tensile Tests of Steel. [*Engineering News*, Nov. 16th].—In view of the recent report on impact tests brought before the American section of the International Society for Testing Materials, a paper read before the American Society of Civil Engineers by S. Bent. Russell, is of special interest. A former paper on impact tests by the same author was reviewed in these columns last year, the present series of tests being an extension of the subject. Mr. Russell practically rebuilt the impact machine, making the pedulum which delivers the blow 200 pounds in weight, and providing means to have the test bar, upon which the pendulum falls, under tension. As the weight drops it breaks the bar and swings beyond more or less according to the strength of the specimen. The weight, dimensions, and distances noted furnish the data from which to calculate the resilience of the test bar. Mr. Russell calculates that fully 90 per cent of the blow is absorbed by the specimen, only 10 per cent going for the inherent errors due to the method of testing. The specimens were prepared as follows: A flat piece is milled out to leave a section ¼-inch wide by 2 inches long, and the full thickness of the bar. Now two nicks ¼-inch deep are milled in, reducing the width of the piece to ¼-inch at the center but leaving full thickness. This, properly clamped, is broken by the pendulum and the results noted. In this way all test pieces had the ¼-inch width between nicks, but ran as the thickness of the sample they were cut from. A table of results is given, from which we see that the highest value for wrought iron is from Norway material, the shock-resisting value of which is 3½ times as great as the ordinary bar. Steel varies much more and all the results show that the ultimate strength and the shock-resisting qualities of a material are not comparable. In an extended editorial reviewing the paper, attention is called to the importance of knowing the resilience of a material used in structural work. As a rule the elastic limit, elongation, and ultimate strength of a specimen is all an engineer asks for to satisfy himself on the quality of his material. Of late, however, a test showing the behavior under-shock has been found advisable to obtain a direct indication of the toughness of the piece. The result is seen in axle, rail, coupler, and wheel tests, the small specimens or test bars being rather better adapted to the checking of material in the stages of manufacture. A continuation, therefore, of the two, or a tensile impact test, would seem to be an advantage, and Mr. Russell has contrived to devise a very good machine for the purpose. The weak point, is that 10 per cent lost by outside influences. The editor rightly points out that a very considerable item of this loss is the amount of work transformed into heat at the moment of contact. The chief criticism, however, is directed against the form of test bar used, a stronger bar of rectangular section, about one-fourth the area at the heads, being the shape recommended. Another point made is the value of this form of testing when not carried out beyond the elastic limit, but within it, for after all we should design our structures with the elastic limit in view only, leaving the extra strength up to the ultimate breaking point as an additional safeguard.

Judging Pig Iron By Its Microstructure. [*Stahl und Eisen*, Nov. 15, 1899].—Two questions are discussed: A. Testing charcoal iron by chemical, mechanical and microscopic means and comparing with two brands of coke iron. B. A new method of treating polished surfaces of iron to study the microstructure. K. Glinz gives the results of some of his investigations on a subject always interesting to those who use pig irons. The charcoal iron used is a German one, is very gray and is added to chilling mixtures. The composition is total carbon 3.42 per cent, of which 3.17 per cent is graphite; silicon 2.76; manganese, 0.77; phosphorus, 0.935; sulphur, .02; copper, .01; and nickel, .06 per cent. The high silicon contents accounts for the graphite running 90 per cent of the total carbon. In spite of the high phosphorus, and as the author contends, high manganese and sulphur, which, however, look very good to American eyes, the strength of the resulting chilled castings is excellent. A series of tests made with this iron give the following data: One bar was 1 inch square by 40 inches long; three others were a little longer and 1 1-5 inches square each. They were tested by the German standard, first transversely and then in tension. The bars were broken transeversely on supports 39.36 inches (1 meter) apart, and stood as follows: No. 1 broke at 759 pounds, with a deflection of 1.4 inches, the tensile strength not being given; No. 2 broke at 1,210 pounds, with a deflection of 1.24 inches. and similarly No. 3 and 4 at 1,045 and 1,133 pounds, with 1.08 and .98 inches deflection. These figures speak well for the iron in question, being among the very best obtainable. To study the iron with the microscope three samples were cast, one in green sand, another in dry sand, and the third in a chill. The eye could readily distinguish the fractures of each cast, the green sand casting being of the coarsest grain, the dry sand casting finely granular, and the chilled piece mottled. Test slips for the microscope were cut from three bars and compared with similar specimens of two other brands of pig iron. Etching was not resorted to, as the removal of graphite in polishing left sufficient contrast to distinguish the components of the iron readily. Microphotographs of six etchings are given, the remarkably long streaks of graphite in the coke iron samples being very prominent. Grouped about these lines of graphite dark masses of crystalline iron may be seen, the balance of the area being filled out with homogenous material. The length of the graphite streaks seems to be the distinguishing trait in judging between coke and charcoal iron, the latter being much shorter, more wavy and ramified, in fact somewhat star-shaped in appearance. The patches of homogeneous iron are smaller and more thickly interspersed between the stretches of crystalline iron layered about the graphite. A greater irregularity in structure is manifest in the charcoal iron, and may in some measure account for its superiority over the more regular and, therefore, possibly weaker coke iron. Mr. Glinz in fact gives this as the principal reason for the use of charcoal iron, for the best chilled castings and the higher grades of wrought iron, a statement which, however, would seem to require further proof.

An interesting study on the behavior of a polished section of cast iron under galvanic action concludes the paper. One of the specimens was given a very thin film of nickel plating. The graphite, crystalline iron, and homogeneous iron (or iron without crystalline appearance) behave differently under this treatment, the nickel coating applied showing the specimen up with much greater distinctness. The graphite streaks being highly nickeled are quite white and show up in brilliant contrast to the darker crystalline masses. A further study of galvanic methods for metallographic purposes is urged.

Large Pumps for Lake Superior Iron Mines.

The Fred M. Prescott Steam Pump Co., of Milwaukee, Wis., mine pump builder, has now in course of construction some of the largest mine pumping engines ever built, and the company has recently received contracts for the largest single order for pumps of the direct acting type, as well as for the largest crank and fly-wheel type, yet given for under-ground installation. For the Aurora mine, belonging to the Carnegie interests, the company is building two large six-cylinder triple expansion pumps of the direct acting type, which will have a capacity to deliver 2,000 gallons of water per minute against a pressure due to a vertical head of 1,180 feet. In other words, these pumps will be located 1,100 feet under ground and pump the water to surface in one lift.

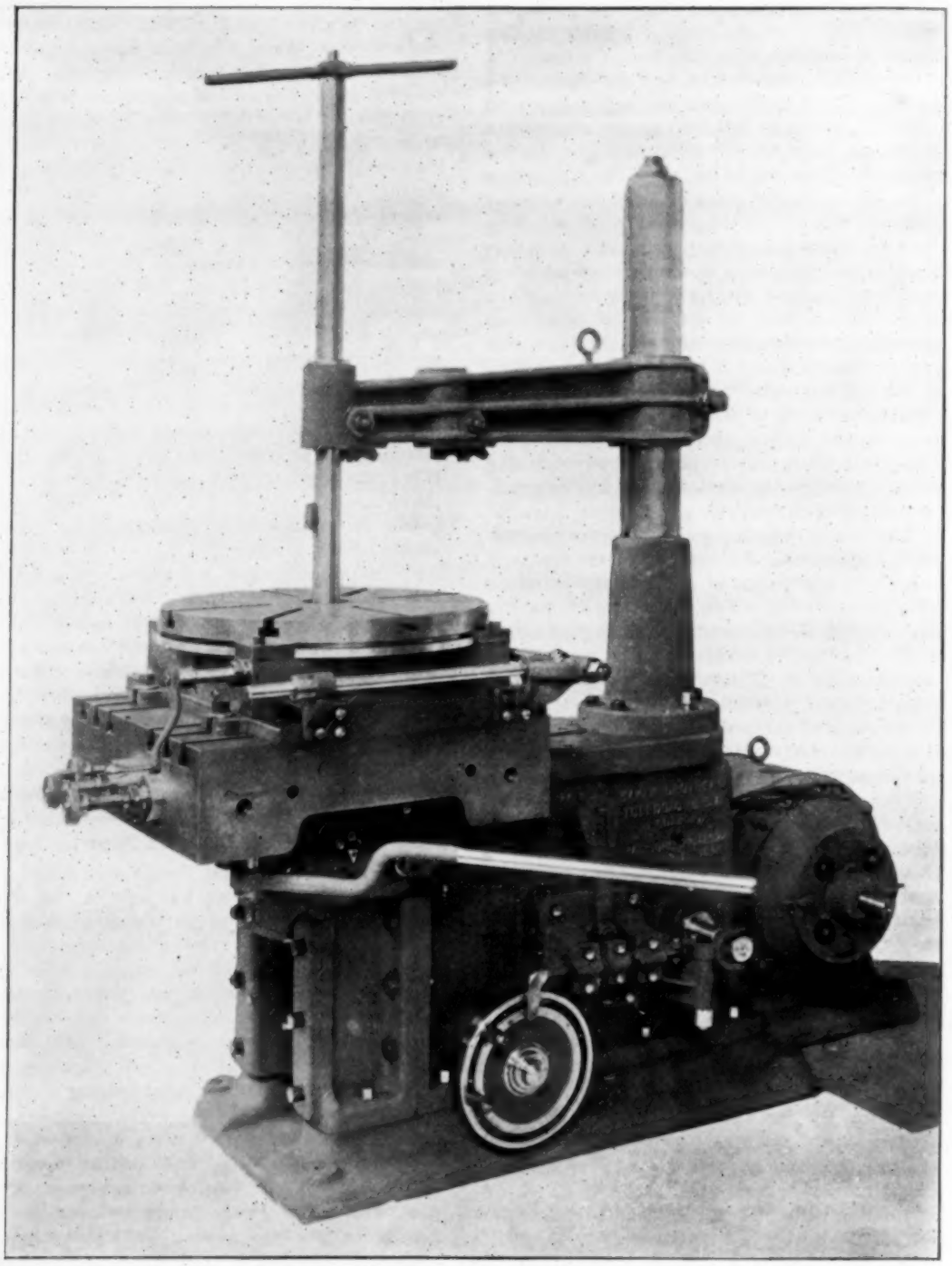
The crank and fly-wheel plant spoken of is for the Penobscot mine on the Mesabi range and consists of two pumps having a capacity of 7,000 gallons per minute. In this instance, the stations in which these pumping engines are to be installed will be cut at a depth of 310 feet, and this will be the head against which this large volume of water will be delivered. It will take two 19-inch and 35-inch by 36-inch cross compound Corliss engines to run these pumps and the plant will contain many mechanical refinements calculated to give the highest possible efficiency under the conditions of service.

The R. B. Seidel black lead crucibles, for which Henry L. Schwarzenberg, of Cleveland, is general sales agent, received the highest award, a silver medal and diploma, at the National Export Exposition at Philadelphia. A good trade for export is reported.

THE COLBURN KEY-WAY CUTTER.

A view is given herewith of the Colburn key-way cutter arranged to be driven direct with an electric motor. The machine shown is the new model No. 3. It has a maximum stroke of 25 inches and cuts a key-way from the smallest up to 2¼ inches wide. One of its special features is the upper arm which gives a rigid support to the cutter bar. A wheel 60 inches in diameter can be chucked on this machine without changing the position of the upright column. The base of the column has several bearings on the main frame, however, and when larger diameters are to be key-seated the column is shifted to a position between the arms of the pulley. This will bring one of the bearings in the over-head arm directly in line with the cutter bar, thus giving the required upper support to the cutter bar, regardless of the diameter of the work to be handled. In this manner pulleys of 10 and 12 feet diameters can be key-seated. Small work can also be key-seated, as a variety of different size cutter bars can be used on the same machine.

The table is adapted to tilt in either direction for cutting tapers and a graduated scale indicates the exact taper per foot. The stroke can be regulated from one inch to 25 inches by the tappets on the stroke-regulating disc at the side of the machine. A micrometer depth screw measures the total depth of the key-way and insures accurate work, making it easy to duplicate any number of key-ways having the same depth and taper. The range of work done on this machine is not confined to key-seating. For instance, our view illustrates an auxiliary circular table with compound movements like a slotter table. There is a large circular opening in the center of this table to which are fitted different sizes of reducing plates, leaving an opening in the center of the table any desired size. With this table a great range of internal slotting can be done, with the advantage over the slotter that the cutter bar is always supported at both ends. A machine of this character for key-seating large work should stand under a crane, preferably a traveling crane.



THE COLBURN KEY-WAY CUTTER.

With an electric drive all belts and countershafting are done away with and the machine can be placed in convenient position and the wires easily carried to the motor. The motor shown on the machine is made by the Bullock Electric Co., of Cincinnati, O., and is known as their type N slow speed motor No. 106. It is mounted on an extension of the sub-base of the

key-seater. The regular clutch pulleys on the key-seater driving shaft are supplanted by clutch gears. The pair of gears on the motor shaft (on the side not shown in the cut) drive the gears on the key-seater. Two of the gears mesh directly together, while between the other two is inserted a rawhide pinion. This arrangement drives the gears on the key-seater in an opposite direction, accomplishing the same result as using an open and cross belt. The clutch is operated by means of a shipper rod inside of the driving shaft. This is actuated by means of the tappets on the stroke-regulating disc on the opposite side of the machine from the gearing. One gear on the driving shaft being smaller than the other runs at a greater speed and thus gives a quick return for the cutter bar. The manufacturers are Baker Brothers, of Toledo, O.

Large Foundry Trade for Next Year.

In his market review from New York, Mr. Archer Brown makes the following statement concerning an investigation Rogers, Brown & Co. made recently, to get some idea of the status of the foundry trade in respect to pig iron consumption: "There being difference of opinion in certain quarters on the real facts as to supply and demand of pig iron, our firm has been at the pains to institute a careful inquiry through their ten different offices on three points. First, do the melters of pig iron in various lines observe signs of falling off of demand because of high prices they are compelled to ask their customers? Second, are stocks of iron in foundry yards larger than usual at this season? Third, have buyers contracted farther ahead than is customary in December? The answers from every part of the United States are almost identical in character. They agree, first, that consumers in almost every line expect larger business in 1900 than in 1899. Second, that stocks on the whole are smaller than usual at close of the year, principally because of delays of furnaces in filling orders. Third, that the contracting ahead has been more general than ever before, and will probably amount to a tonnage equal to three fourths of actual requirements prior to July 1st, 1900."

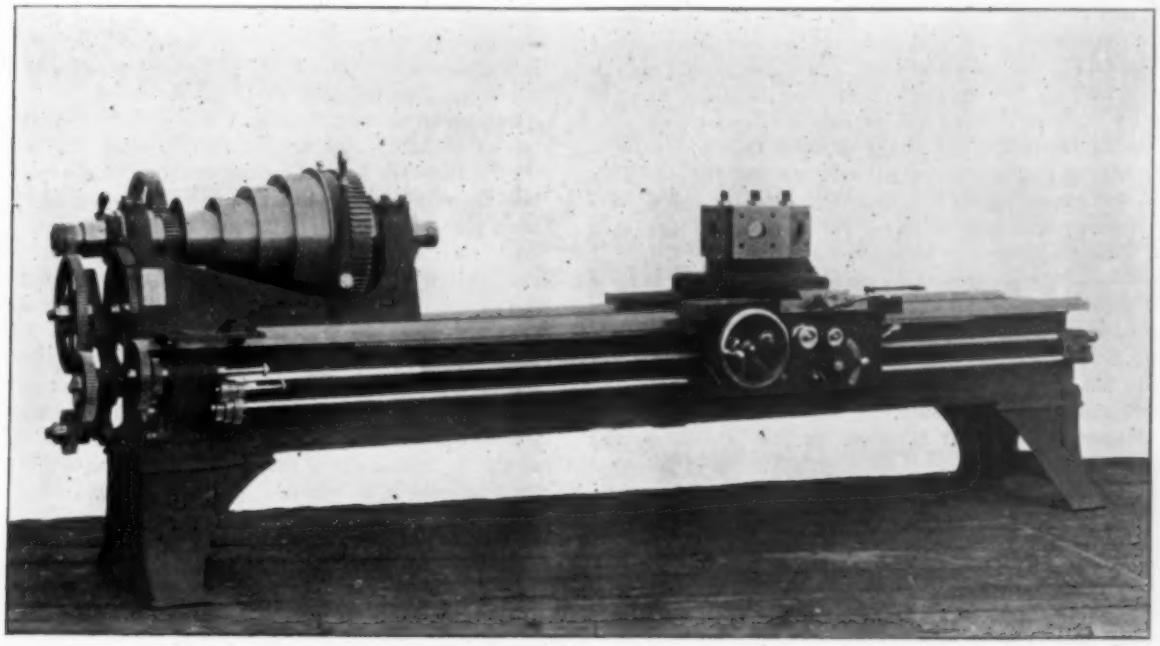
Charles H. Besly & Co., 10 and 12 North Canal st., Chicago, Ill., report that December business has started in unusually brisk. At their plant at Beloit, Wis., they have just added new boilers and engines supplementary to water power and are working 16 hours, four days a week, and the balance of the time 10 hours a day. Numerous orders have been received for Helmet bronze in sheet for flat springs, and in wire for round springs. The firm carries an immense stock of this material at its Chicago store and is prepared to make immediate shipments. Owing to advances in raw material there have been a number of changes in prices in standard machinists tools and supplies. Besly & Co. suggest that orders be placed at once as they will not make advances on this line until after Jan. 1, 1900.

TWENTY-FOUR INCH TURRET LATHE.

The half-tone below shows a 24-inch turret lathe intended for producing economically all work which can be either held in a chuck or clamped to a face plate, and permits of any operation possible with an ordinary engine lathe. To facilitate all changes of cutting speeds and feeds, ample provision has been made, and with this in view the back gearing of the head stock is is engaged or disengaged by the clutch lever shown in front of it. The friction clutches are of recent design, and so arranged that all wear can be compensated for, and have sufficient power to obviate slipping under the heaviest cuts. The feed mechanism is driven independent, from the screw cutting apparatus, by a train of gears so arranged that six different ratios of feed are at instant command while the lathe is in motion.

As appears from the cut, the proportions are massive, while the machine has been arranged to be convenient for operation, a feature often neglected in heavy tools.

The length of the head stock and the heavy spindle insure proper resistance of springing due to heavy overhung work, and rapid results may be accomplished without difficulty. The carriage is very heavily gibbed to the outside of the bed, front and back, and is fitted with a turret slide of unusual proportions, 14 inches in width and 20 inches in length, upon which the turret proper revolves. The turret is hexagonal in



24-INCH TURRET LATHE.

form and 14 inches in width across the flats, the holes being 2½ inches diameter, and the construction is such that a bar may be passed entirely though the turret.

The indexing is done by a hardened and ground pin, which is withdrawn by one of the levers shown on the right side of of the turret, whereas the other lever is used for clamping. This makes a very convenient arrangement, which leaves the working side of the turret free from all obstructions.

The regular engine lathe apron is applied to the carriage which gives friction longitudinal feed, power cross feed, for the turret slide, sufficient to face the full swing of the lathe, and split nut to engage the lead screw for screw cutting purposes. A fixed stop at the rear of the carriage centers the turret so that when boring bars are used no difficulty is experienced in properly centering them. The spindle is fitted with a hardened steel bush so that the ends of long boring bars may be supported to permit of rapid and accurate work.

It will be seen that any pieces which must be bored, faced, turned on their periphery, or threaded inside or outside, can be finished on this machine without removing from the chuck, and without the use of what may be strictly called special tools, and where but few pieces of a kind are to be made, its use will prove economical. It is built by the Springfield Machine Tool Co., Springfield, O.

MACHINE SHOP LOCATION AND DESIGN.

The specifications for the proposed shops of the Lane & Bodley Co., at Bond Hill, a suburb of Cincinnati, were given in these columns some months ago. In a paper recently prepared by an officer of the company the following points were brought out relative to location and design and reasons therefor:

"First—The most suitable manufacturing building is a ground-floor surface, protected from the weather, and direct rays of the sun without interfering with the light.

"Second—A plant started on a scale however small should be capable of indefinite extension without expense in altering or in any way interfering with previous construction.

"Third—Land enough should be secured in the first instance to avoid the future necessity of removal and abandonment of a plant at a loss, owing to lack of room.

"Fourth—With land at $2,000 per acre, or less than 5 cents per square foot, it is cheaper to use land for one-story buildings than to save land by building more than one story.

"Fifth—One-story buildings may cover every square foot of available land, and every foot be equally and perfectly lighted from the north by saw-tooth skylights.

"Sixth—It is cheapest to support machinery directly on the ground. There is no vibration, no danger of heavily loaded floors falling when buildings are old, nor of upper floor loads falling upon the lower in case of fire.

"Seventh—In machine manufacturing, where heavy work is done, it is always accompanied by a certain amount of medium and of light work. The buildings for the heavy work are necessarily high, and cost, say, $2 per square foot of floor surface. For medium work, a medium height only is necessary, costing, say, $1 per square foot; and for the light work a low building costing but 40 cents per square foot.

"By taking the fullest advantage of these facts and providing buildings of a minimum height and cost for the work to be done, and providing for the extension of any one of the three classes without interference with the others, the best and the cheapest plant may be secured.

"Eighth—Such a plant as is herein proposed is suitable for a wide range of manufacturing. The plant, if abandoned by its original occupants, would be a desirable one for any manufacturing purpose; consisting, as it does, simply of a certain enclosed but amply lighted ground-floor area, capable of cheap and convenient extension."

The following comment is made on the above by the *American Machinist:*

"The second proposition is one whose importance was formerly almost universally overlooked. It has received more attention in the design of later shops, and one of the best examples of this, so far as we know, is to be seen in the shops of the De la Val Co., at Poughkeepsie, designed by Mr. Frederick Hart. These shops are so arranged that additions can be made in two directions, either by adding to any number of units or adding units, and that this can be done with practically no disturbance of the already existing plant. This feature is also present, we believe, in the Lane & Bodley design.

"As regards the third proposition, it may be remarked that usually there is plenty of land for any extensions that may be required, and securing it for such use when needed is only a matter of price. The trouble is that when the plant is first located one of the strongest considerations is usually low or moderate priced land. Then is the time to secure enough of it for future needs; for if this is not done, then when extensions finally become necessary, the value of the land may be doubled, or more; and although this value may be the direct result of the shop's location, its proprietor will usually secure no concession on that account. And although, in one view of the case, this land value should be taken account of in the cost of goods produced by use of it, it need not, and should not, be taken account of where the money has not been paid for it, and when by removal of the shops to another locality this value would disappear.

"As to the fourth proposition, Mr. Lane writes in answer to a question of ours: 'It is not to be understood that $2,000 per acre is the maximum price of land upon which it is cheaper to build a one-story shop. There is a point right here that your diagram editor should work up for the benefit of some of us who are groping. The problem was suggested by the fact that in a four-story building for instance, the wall which supports the roof should be carried independently through the third and second and first stories to the ground. All of the material, therefore, below the level of the fourth floor is necessarily wasted, so far as affording support for the roof is concerned, it being introduced simply for the purpose of transferring this support to the earth. Whereas in case of a one-story building, this roof support between the fourth floor and the roof would be directly upon the earth. The same applies to the supports for the fourth and third floors. Besides, a storied building requires light areas. These of course, for some purposes are valuable for storage and are not wasted. There is, I think, a very pretty problem here and the possibility of a table showing at what price per square foot of ground one story buildings are cheaper than two or more stories.'

"In the description of the shops referred to above, the following language is used: 'If ground can be had at the same or a lower price per square foot than the cost of a square foot of inclosed and roofed shop floor, a single floor is better than many floors.' The shop referred to cost 75 cents per square foot of floor space, which makes the above quoted words equivalent to saying that a price of $32,670 per acre for land, it is still best to construct a single-floored shop.

"The sixth propositon is, we think, an important one. We all know that, talk as we may of our splendid shop floors, there is still nothing like the solid earth as a support for machinery; and it is a familiar fact, that in case of fire, most of the damage to machinery is apt to be the result of the fall of machinery from upper floors on to that which is below. As to the seventh proposition, there is, we think, more room for difference of opinion if we take into consideration the fact that few of us can foretell with certainty what the work of the shop will evolve into, nor what changes of arrangement may become necessary or advantageous. Regarding the relative costs Mr. Lane says: 'It is not to be understood that the amounts of $2, $1 and 47 cents represent the actual costs of the different types of building or of different heights of building of the same type; the high and the medium being of the same type and varying only in height. These figures were used simply to illustrate. It is true, however, that the high building greatly exceeds in cost per square foot of floor space that of the medium building. It might be considered that the only increase in cost would be that of the horizontal belt of siding, the height of the belt representing the difference in the total height of the two buildings. This does not, however, represent the entire increase in cost.

" 'The duty of the roof truss, in addition to supporting the roof loads, is to brace the horizontal sides against wind pressure, and the requirement in each individual member of the truss is greater, owing to the wind pressure than for supporting the roof loads. The posts themselves are necessarily of greater cross section to resist bending, due to increased height, as are the foundations also due to increased height and consequent increased wind pressure.' "

THE Davis Coal & Coke Co. has consolidated with the railroad which the Davis-Elkins interests control as they have controlled for some time the coke company. By a nearly unanimous vote of both corporations the capital stock of the West Virginia Central was increased to $10,000,000, and the increased stock was applied to purchasing the lands and properties, real and personal, of the Davis company. This brings under the ownership of the West Virginia Central nearly 100,000 acres of coal and timber lands, east of the Alleghenies. The coal department of the consolidated company has about 700 coke ovens, which will soon be increased to 1,000. The capacity of the mines is now about 5,000 tons daily, and about 800 tons of coke. It is proposed, under the consolidation, to increase the output of the mines to 8,000 tons of coal daily, and the coke to 1,200 tons daily. The officers of the consolidated company are ex Senator Henry G. Davis, president; Senator Stephen B. Elkins, vice-president; F. S. Landstreet, manager of the sales department; C. L. Bretz, general manager of the railroad department.

IRON MINING CONDITIONS IN CUBA.

Dr. Wm. B. Phillips writes interestingly in the *Engineering and Mining Journal* of the conditions and prospects of the iron mining industry in Cuba as he found them on his visit to the island a few months ago. We make these extracts from his letter:

I visited the manganese mines of the Ponupo Mining & Transportation Co., at Ponupo, the iron ore mines of the Juragua Iron Co., at Firmesa, and the iron ore mines of the Spanish-American Iron Co., at Vincent above Daiquiri. All of these mines have resumed operations since the close of the war and are now getting into fair condition. Indeed the war did not greatly damage any of these properties. They suffered from the long shut down, of course, but the actual losses due to the carrying on of hostilities in the vicinity were inconsiderable.

It has been remarked before by those who were familiar with Cuban conditions that the Spaniards from the province of Galicia, Spain made the best miners, the native Cubans not taking very kindly to such work. This seems to be the case, and it is a great pity that such of the rank and file of the Spanish soldiers from this province as chose to do so should not have been allowed to remain in Santiago, where their services are in such demand. If considerable numbers of the common soldiers had remained in Santiago Province there would not have been any disturbances growing out of their presence. On the contrary, they would have taken hold of the work that the Cubans do not like and can not be induced to do except under stress of hunger. The native Cuban is either a herdsman or a farmer, or both. He likes to grow cattle, or to cultivate sugar, coffee, chocolate, corn, fruit, etc. This kind of labor suits his temperament, both his personal and his hereditary inclinations.

The only mining operations now carried on in Cuba are in the Province of Santiago, and are confined to iron and manganese ores. There are two companies mining iron ore, the Juragua and the Spanish American, with a third, the Cuban Steel Ore Co., about to start near Cayo Damas, some 40 miles west of Santiago. There is only one concern mining manganese, the Ponupo Mining & Transportation Co., which also owns the Sabanilla and Maroto Railroad, connecting Sanitago with Ponupo and San Luis by way of Cristo.

Between San Luis, which is about 24 miles from Santiago, and Santa Clara, on the line between Havana and Cienfuegos, there is a gap of some 365 miles without a railroad and very few ordinary roads. Some day this gap must be filled, for all-rail communication between Havana and Santiago is both a military and commercial necessity. The intervening country is extremely fertile and portions of it are well wooded with mahogany, cedar, etc. Very little is known as to the mineral wealth along this line, although it is likely that good manganese ore occurs at intervals. But the chief mineral districts of Cuba are Santiago and Pinar del Rio.

The best thing that could be done for the development of the mineral wealth of Cuba would be the granting of concessions for railroads. Not only is this true with respect to minerals but also and particularly with respect to sugar, coffee, chocolate and timber. There are thousands of acres of very fertile land that cannot be utilized until a railroad is built near them, and hundreds of thousands of feet of valuable timber inaccessible for lack of transportation. Just why no concessions can be obtained does not appear."

A Small Cupola at Small Expense.

In the *Tradesman* E. H. Putnam indicates an economical method of building a baby cupola:

It frequently happens that a foundryman wishes he had a small cupola for some special work, and the only reason that he does not make one is that he has an idea that the expense will outweigh the convenience. It is customary to make these cupolas of wrought iron, supporting them on trunnions, on a specially constructed frame, so that the cupola can be turned bottom end up if desired, for the greater convenience of fettling; i. e., cleaning and making ready. This cupola is also provided with a drop bottom. The height is limited to convenience for charging in at the top. A disconnected stack is provided, with a widely-flaring bottom section which telescopes freely within the stationary section which extends through an iron collar in the shop roof. These cupolas are generally made very small, in order that they may be easily tilted. But here is an easy, cheap way to make a fairly good-sized "baby" cupola; one that can melt a ton heat without any trouble: Just take a pulley-ring pattern and cast from it three or four rings, drawing it up to get the desired depth. Rivet some inverted U-shaped lugs on two opposite sides of each ring, through which to thrust bars for lifting. Line each ring separately with fire-brick. Set the first ring on the cast iron bottom. After luting with fire clay, lute the joint and set on the next ring; and so on to the end. The cast bottom may be a square casting one inch thick, with a hole for the drop door. The latter need not be hinged; but make it with a flange all around, and prop it in place in the usual way. The tuyeres should be made of cast iron, and the same general plan as in the case of a large cupola. The stack is the same as described above. Bolt four cast iron legs to bottom plate. This cupola is very simple, and can be made "for a song." I recommmend the use of a 36-inch pulley-ring for pattern; any smaller is too trifling.

VARIANT IDEAS ABOUT A CRANE.

A friend of ours wanted to put a crane into an electric power station that is under his charge and asked for bids. Some rather curious things resulted from this, which he relates as follows:

"The writer having lately sent out specifications for a 25-ton, 46-foot span, 45-foot lift, three-motor electric crane, left the choice between chain and steel wire rope to the crane builders. The difference of opinion expressed by the bidders in regard to the relative advisiability and difference in cost between wire rope and chain is striking, as will be noted by the following:

"One of the best crane builders states: 'The hoist is so very great that we would be obliged to build a special trolley, or a trolley of a large capacity, in order to use chain. This would increase the length of the supporting end pieces, resting on the wheel bases, and would prevent the crane approaching either end of the building as near as could be accomplished were rope used. The wire rope would be very much cheaper and very much lighter, and we trust that it will meet with your views, and that you will pardon us for not making the bid for chain hoist.'

"An electric crane builder of probably the oldest standing, and certainly one of the best known in this line of business, states: 'There will be no difference in the price of the crane, whether equipped with chain or rope.' They show in their design and specifications the preference and use of chain.

"Another manufacturer of one of the best cranes in the country states: 'The height of lift, 45 feet, is too great to admit of the use of of our standard design with chain hoist, and as you evidently appreciate the advantages of rope, I will not make a separate special estimate for a trolley with chain hoist. For such high lifts with chain, a double drum trolley is practically a necessity, but with the use of rope a single drum may be used, with the advantage over the double of load not turning on the hook during the process of hoisting or lowering.'

"Still another maker of exceedingly good reputation states: 'In this connection permit us to say that we would advise your using the chain as by using the wire rope the sheaves for the hoisting block have to be so large that it takes six or seven feet off your effective lift, and you get no better results in any way than you would with the chain, as wire rope manufacturers are very specific on the point of having certain size drums and sheaves for certain sized ropes.'

"Another bidder of high standing quotes rope hoist at $350 less than the chain, and recommends the chain."—[American Machinist.

The Republic Iron & Steel Co. has decided to build an auxiliary stack at its Haselton, O., furnace plant. Improvements will be made also at Hannah Furnace, Youngstown, including the addition of a fifth stove. It is expected the changes will permit of an output of 300 tons a day.

75 YEARS OF IRON MANUFACTURE.*—II.

BY JOHN FRITZ.

The opposition to the three-high mill now came in from all quarters. The heaters on the rail mill were unanimous in their condemnation, and waited on the company to tell them what a direful failure it would be. Next I had to meet the combined prejudice of the ironmasters, who were a power at that time. Some of them would tell the managers that the whole thing was certain to be a failure. Next came my friends in the trade and out of it, begging me to abandon what would surely prove a failure and blast my reputation for life. One of my dearest friends, with whom I had been employed for a number of years, came to see me and, if possible, to get me to change my plans. To them all I said, "No, I can make it work, and it is the only plan that can be adopted that will save the company."

After all these years there is no person other than myself who can fully appreciate the trying position the managers were in. On the one hand I was to build a mill on an untried plan, and absolutely refusing to build the mill they asked for, knowing full well that only in a small degree would it remedy the trouble, and that the money spent on such a plant would be thrown away. On the other hand, there was a strong party of stockholders, protesting in the most positive manner against going on with my plans, and notifying the managers that they would hold them personally liable for all the loss and damage that might grow out of their unwise action, as they considered this action to be, in adopting a new and untried method that was against all practice in this and the old country, for at that time we were expected to be followers instead of leaders. Notwithstanding all the opposition and trouble we had to encounter, the work on the mill was being pushed along as fast as it was possible. But there were many difficulties in the way. The most serious was the want of proper tools and facilities for doing the work. Many makeshifts had to be improvised, which all required time and labor. During all this time there was much talk and speculation going on in regard to the final result, to all of which I gave but little attention.

First Work of the Three-High Mill.

At length the mill was completed, and on the third day of July, 1857, the old mill was shut down for the last time. On the fifth we commenced tearing the old mill out, as the new one had to be put in the same place. The work was pushed as fast as possible, day and night, but, as it was before the days of electric lights, the night work could not be done with the same expedition as today. At the same time everything in the rail department was remodeled and the floor line of the mill was raised two feet. On the 29th of the same month everything was completed and the mill ready to start. The starting of the mill was the crucial period. In giving an account of the starting of the mill, I can probably do no better than quote from a paper written for a former occasion:

There were no invitations sent out. As the heaters to a man were opposed to the new kind of mill, we did not want them about at the start. We, however, secured one of the most reasonable of them to heat the piles for a trial. We had kept the furnace hot for several days as a blind. Everything being ready, we charged six piles. About 10 o'clock in the morning the first pile was drawn out of the furnace and wet through the rolls without a hitch, making a perfect rail. You may imagine what my feelings were as I looked upon that first and perfect rail ever made on a three-high train. And you may know in part how grateful I felt toward the few faithful men who were about me, and who had stood by me during all my trials and difficulties. Among these were Alexander Hamilton, the superintendent of the mill, and Thomas Lapsley, who had charge of the rail department, Wm. Canam and my brother George, all of whom have gone to their reward.

We now proceeded to roll the other five piles. When two more perfect rails had been rolled we were obliged to stop the engine for the reason that we were so intently watching the rolls that the engine had been neglected, and, being new, the eccentric strap got hot and bent the eccentric rod so much that the engine could no longer be worked. As it would have taken some time to straighten the rod and reset the valves, the remaining piles were hauled out from the furnace onto the mill floor. About this time, the heaters, hearing and seeing the exhaust of the engine, came into the mill in a body from the opposite end of the mill to where the rails were. Seeing the unrolled piles lying on the floor, they took it for granted that the new train was a failure; and their remarks about it were far from being complimentary. Mr. Hamilton coming up, and hearing what they were saying about the mill, turned around, and using language more pointed than polite, told them if they would go to the other end of the mill they would see three handsomer rails than had ever been made in their country, Wales. After getting the engine in shape, the day being Friday, we ran all day, and at night put the regular night turn on.

Everything worked well up to noon on Saturday, it being our custom to stop rolling at that time. About o'clock in the evening Mr. Hamilton and myself left the mill, and on our way home congratulated ourselves on the fact that our long line of troubles and disappointments was now over. About an hour later I heard the fire-alarm whistle blow, and rushing back to the mill, found it one mass of flames from end to end. In less than one hour's time the whole building was burned to the ground, and a story was started that the new mill was a failure, and that we had burned the mill to hide our blundering mistakes. The situation of affairs on that Saturday night was such as might appall the stoutest heart. The product of our labors and anxieties lay there, a mass of black and smoking ruins, and the money that was so hard to get with which to build the mill was gone. The prospect was indeed gloomy, but there was one gleam of light amid all the darkness; and that, the pile of perfect and new rails, which, as Mr. Hamilton had said, had never been beaten in Wales, from which country the greater part of the rails used at that time came. Above all, the mill had been tried and found to work magnificently, and it was these two facts that gave us all fresh courage, and enabled us to rebuild the mill.

The next day being Sunday, it was devoted to rest and to thinking over the matter. On Monday morning we commenced to clear up the wreck, all the workmen giving a full day towards it, and began the work of rebuilding. In four weeks from that time the mill was running, and made 30,000 tons of rails without a hitch or break of any kind, thus making the Cambria Iron Co. a great financial success, and giving them a rail plant far in advance of any other plant in the world. This position they held, unquestioned, both for quality and quantity until the revolutionary invention of Sir Henry Bessemer came into general use.

Improvements in Construction.

In the construction of the three-high mill there were many changes and improvements on the old two-high mill. Up to this time the leading spindles had a groove cut in them to weaken them, so that if any extra strain should come on the rolls, they would break instead of the roll; and the couplings were made light so as to act as a kind of a safety-valve. Then there was a breaking box placed between the screw and the roll. If there was not one of these safety devices breaking each day, the pattern was made lighter. The result was that some of them were breaking several times daily, furnishing a constant source of annoyance. In building the new mill they were all made so strong that they were not calculated to break. The breaking box on top of the roll was made solid, as they were apt, when they gave way, to break the collars on the rolls, which should, if posible, be avoided. All these changes were stoutly opposed by the foremen and workmen of the mill. A few days before the mill was ready to start, the superintendent of the mill discovered that the breaking box was solid; he then got the pattern and took it to Mr. Lewis, the pattern-maker, and told him there was a mistake, that it was made solid. Mr. Lewis told him that it was made as the old man had ordered it, to which the superintendent said, "The old man has gone crazy." He looked me up and wanted to know if I had ordered the breaking box for the new train solid. I said "Yes;" he replied that if with solid spindles, heavy coupling boxes and solid breaking boxes on top of the rools, a piece should enter a wrong groove, or a collar should form on the rolls, which was sure to take place, the mill would be broken to pieces. To which

*An address delivered in Convention Hall, National Export Exposition, Philadelphia, at the celebration of the seventy-fifth anniversary of the Franklin Institute.

I replied: "I would rather have a grand old smash-up once in a while than be continually breaking something and keeping the mill standing half the time and the metal wasting in the furnace." He said: "Well, you will get it, sure." But we did not, and, as before stated, the mill made 30,000 tons of rails without a break of any kind, which, at that time, on iron, was nearly a year's work. The heating furnaces were rebuilt, making them larger, the roofs much higher, and the length of the furnace greatly increased, which about doubled the work that had previously been done. There were also a number of improvements made on the train to facilitate the work, and make it much easier for the men. Among them was the introduction of the driven feed-roller, out of which, later on, came the blooming table, which is now indispensable in the rolling of steel ingots either on a three-high or reversing mill.

Era of the Bessemer Process.

In 1864 the Bessemer process was introduced in this country. Its introduction and perfection will ever remain one of the most interesting epochs in the history of the iron business.

As already stated, the forge carpenter and millwright were superseded by the machinist. Immediately after the introduction of the three-high mill all the rail mills in the country were changed and all the new ones that were built adopted the same plan. In fact, as Mr. B. F. Jones, one of the oldest, one of the leading and one of the most practical and successful ironmasters in the country, and one of the very first to see the advantages of the system, said to me a short time since, it was the commencement of the great improvement which took place in the iron works after 1857 which paved the way for the introduction of the phenomenal "Bessemer" process, which, as the Hon. Abram S. Hewitt says, takes its rank with the great events which have changed the face of society since the time of the Middle Ages.

At this time the machinists before alluded to were called to the front to brave the danger and fight the great battles that have ever to be encountered in the introduction of new metallurgical processes, and in none were the difficulties more alarming and disheartening than in the Bessemer process. These men had now received a training which eminently fitted them for the duties they were called upon to perform. Having been inured to hard work, they entered into this new field with such an amount of energy and determination that it made failure impossible.

Difficulties and Dangers.

In witnessing the beautiful and interesting but simple process of blowing a heat of metal, and the regularity with which it is done at this time, and the quantity turned out, it is impossible for one wholly unacquainted with its early history to even in a measure realize the fear and anxiety of those who were responsible for the result. When a charge of metal was poured into the vessel our anxiety commenced, and as the heat increased, our anxiety increased in a corresponding ratio, until both became intense. It was when the heat was the greatest that accidents were most likely to happen. The refractory material with which the converters were lined, especially the bottoms, would become plastic, and when in that condition the effect of the heat and the blast would waste the tuyeres and bottoms away so rapidly that from one to three heats were all we could get off of one bottom. Frequently they would give out at the first heat, then out would come the metal through the bottom; and having to use much water about the converter, the place under the vessel was at all times wet, and the result was explosions, often very dangerous, as the hot metal was blown in all directions, frequently inflicting serious injuries on the workmen, a calamity greatly dreaded and the cause of the gravest anxiety to those in charge. When an accident would occur anywhere about the works the first question asked would be: "Is any one hurt?" If not we would go to work at once to repair with that object only in mind. If, on the contrary, some of the workmen were killed or seriously injured, it was impossible to describe the distress of mind that the person in charge had to endure. The anxiety one had when the charge was put in the vessel was increased with the heat until the heat was blown; but it did not end with the blowing of the heat. When the vessel was turned down it sometimes went too far and some of the metal ran out, resulting frequently in a grand pyrotechnic display of an exceedingly dangerous character. The next operation was to get the metal in the ladle, which was generally not a very difficult one, but it would frequently burn through the ladle, and then the only thing that could be done was to let it run into the pit and order all hands out of the way, for fear of an explosion. As soon as the metal was set all hands commenced to clean the pit, which was no easy task. Here were eight tons of molten steel in the pit burned fast to ingot molds, bottom and sides of the pit, and to everything that would not burn up. If we were so fortunate as to get the ladle over the pit in good shape our anxiety was not yet at an end. It quite frequently happened that the stopper would pull off the end of the rod; then we had to use what we call a pricker to open the nozzle from the bottom. If the metal happened to be cold, which at that time it was apt to be, the nozzle would freeze up, as we called it; then the metal would have to be poured out of the top of the ladle into the mold, cinder and steel all together, with the result that generally the most of it got into the pit; then, again, if we escaped an explosion we still had a mess in the pit. Altogether the difficulties we encountered were enough to appall the bravest hearts. My brother George once said, when at Cambria, that he did not believe there was a man who ever went into the Bessemer business, and was responsible for the result, who did not at times wish he had never gone into it; and so far as my experience goes I can fully verify it. And, further, I think that, if it had not been for the interesting and exciting character of the business, but few men would have been willing to endure the trouble and anxiety and to endure the physical labor and danger to which he and the workmen were constantly exposed long enough to have placed the business on a commercial basis.

Having alluded to the trouble we had with the converter tuyeres which caused so much anxiety and loss of time, I will now explain how we got over the difficulty at once. We were only getting from two to four heats off of a bottom and then would have to turn the vessel down and put in tuyeres during the blow. It so happened that, at a time when we were having more than the usual trouble, the vessel was turned down and we were putting in two tuyeres when I was sent for, to go to the blast furnace, there being trouble there. As soon as the vessel was turned up I started for the furnace, not in the serenest state of mind; on the way over I was thinking over some new device for making the bottoms so that they could be burned in order to make them harder and better able to resist the action of the blast, as I had been thinking that that was one of the troubles. As I went into the furnace I noticed some fire bricks about 5 inches square and 16 inches in length, such as are used in blast furnace lining. At once I ordered some of them sent over to the converting department, and as soon as I could I went over and had one of them placed on end in the bottom between the tuyeres and well rammed in with ganister, put in the oven and well dried and put in the vessel. Result: Twelve heats off of one bottom. From this time our troubles began to diminish, and instead o making 10 and 12 heats per day we soon ran up to 50 and 60 heats in 12 hours, and some of the works are now making 70 and 80. This system of making bottoms was at once generally adopted, and is still in use.

REGARDING the recent trials made at sea by the Government with the Lidgerwood Mfg. Co.'s coaling device, already described in these columns, the *Marine Journal*, of New York, says: "The absolute success of the Miller conveyor for coaling vessels at sea, in the trials just made outside Sandy Hook by the battleship Massachusetts and the collier Marcellus, means another splendid attainment in naval development. The tests showed that more than 20 tons per hour could easily be passed by the overhead system from collier to warship. With this system it will be henceforth altogether unnecessary for war vessels to seek a port to coal, for with anything like a smooth sea they will be able to maintain their station, as for instance when on blockade duty, and have the coal put on board almost as readily as if moored alongside a pier. This in fact will be possible at sea in any weather when it is not too heavy to have hatches off. The Lidgerwood Mfg. Co. are to be congratulated on having perfected this valuable device which will inevitably result in such great naval advantage."

NEW LATHE CARRIAGE TURRET.

A new design of turret for a lathe carriage manufactured by Fay & Scott, Dexter, Me., is shown in the accompanying illustrations. It is designed to go on the cross-slide in place of the tool block, and is made to hold either four or six tools, and so arranged that a single movement of the lever handle, seen at the right of Fig. 4, forward and back, releases the turret, turns the next tool into position, and locks the turret. The turret turns upon a fixed stud, shown in the vertical section, Fig. 1, and this stud has a hole passing through it in which is the rod A. To the lower extremity of A is fastened the cam D, and a portion of this cam, shown by the dotted lines in Fig. 2, acts upon a rounded corner of the locking pin E, and forces it out, this rounded corner being on a portion of E that is below the indxe ring. The dotted lines in Fig. 2 show this also. To the cam D is attached the pawl I, which by the above mentioned movement is carried back to engage with the next internal notch of the indexing ring, and when the lever is drawn forward the turret is rotated until the locking bolt engages with the next external notch, the bolt having been previously released by the cam D.

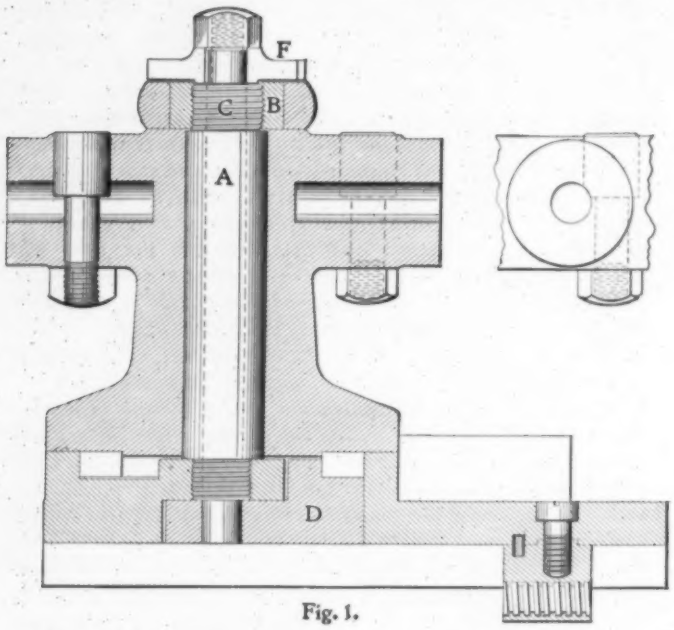


Fig. 1.

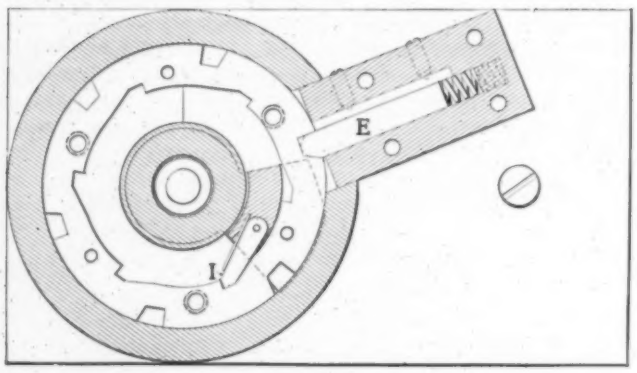


Fig. 2.

When the motion of the turret is arrested by the lock bolt, the operator presses upon the thumb lacth J, Fig. 4, which disengages the lock bolt in the hand lever from the notched disc F. Fig. 1, y bwhich the spindle A is rotated, and when thus released a further movement of the lever turns the threaded ring B upon the thread, which is cut upon the fixed stud, and thus clamps the turret firmly in place. The lever is placed upon the ring B, rather than directly upon the stud, because by that means it can be made to operate in the most convenient position. A fastening for the tool shanks, an improvement on the common set screw, is shown, and the device is well adapted for duplicate operations requiring several tools to be used in succession.

The manufacturers supply the turrets either as shown in the cuts, to take tools with round shank, or another style of tool holder, taking tools with rectangular shank, 1-inch by ½-inch. The turret is supplied for Fay & Scott's own lathes and is also made for other lathes by having a template to which to fit.

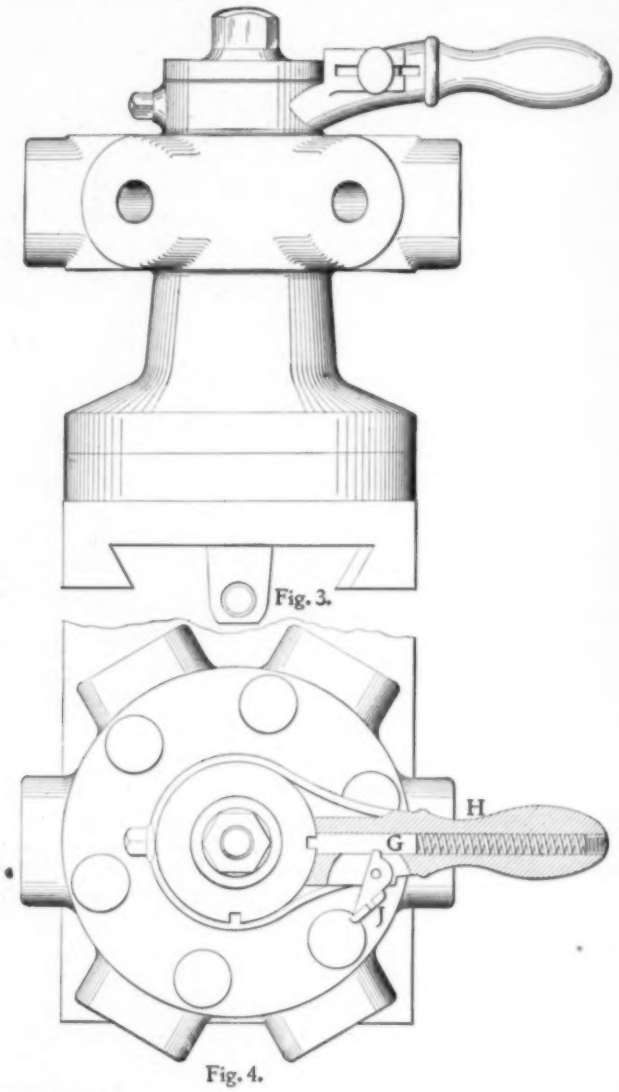


Fig. 3. Fig. 4.

NEW LATHE CARRIAGE TURRET.

American Steel Products in Germany.

A director of a large German steel plant writes in the *Berliner Tageblatt* of the increasingly marked prominence of American metal products in Germany. He advises imitation of American methods and commends American railroad construction and system. In general the communication reflects a feeling that is shared by many leaders in German industry:

"Concerning the industrial situation in the United States the impression derived by a foreigner is that the present remarkably favorable conditions are solid, legitimate and likely to be permanent. This is particularly true of the mining and metal industries. An important element in the present unparalleled prosperity of these interests in America is the strong, steady, continuous demand for metals, particularly those used in electrical machinery and installations. It is also true that America far surpasses us in the case of iron and steel for building purposes. It is undeniable that the American iron works operate under decidedly more favorable operations than our own. America possesses far richer and more widely distributed iron ore deposits than Germany. To this must be added the important advantage that the construction and equipment of their iron and steel works far excell those of Germany, and indeed every other European country. The substitution of machinery for manual labor in the United States is astonishing. Finally comes the enormous advantage which Americans enjoy through the high development of their railway system and their low freight rates. Under these

conditions the German iron industry finds in the United States its greatest, most important and most dangerous competitor. And we have not experienced the worst. When once a relapse occurs in the American market, or a weakening of demand in the world's metal markets, then we shall feel the full force of the sharp and powerful competiton from America, especially in heavy plates, structural steel and iron, and rails. Above all is this true in respect to rails, the production of which is developed to an astonishing degree."

AUTOMATIC PLANER TOOL.

The latest application of the inserted cutter principle as applied to planer work is the Armstrong planer tool manufactured by Armstrong Bros. Tool Co., 106-108 West Washington st., Chicago. The cutters are placed in grooved seats and may be adjusted to any desired angle. At the same time they may be so locked in position as to make slipping impossible. The manufacturers consider the rectangular shape preferable to the square, since it is stiffer and may be ground with more side rake than square steel. Rectangular-shaped cutters also admit of sharpening oftener than square, without re-shaping the point. The shank is steel, drop forged, and is case hardened. The cutters are of self-hardening steel.

The use of the planer tool either right hand or left hand is illustrated in Fig. 2, which shows it at work in close corners. This gives a good general idea of the clearance obtained, and some of the angles at which the cutter can be set. It is stated that such a job as here shown could be finished with the Armstrong planer tool without shifting the position of the work on the bed. Fig. 3 shows the Armstrong planer tool cutting a key-way with the cutter reversed and the tool

FIG. 1.—ARMSTRONG PLANER TOOL.

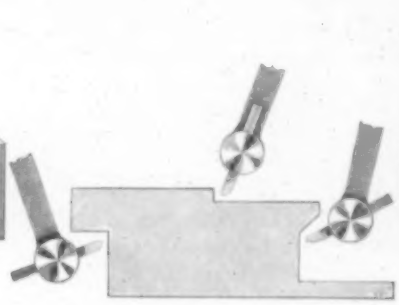


FIG. 2.

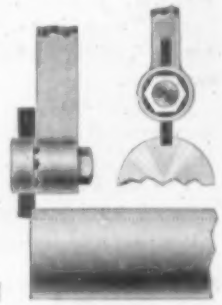


FIG. 3.

turned around, throwing the cutting point behind the center of the tool, practically working as a "goose-neck" tool.

The Industrial Commission at Washington on Dec. 8 heard the testimony of Nathan A. Taylor, of the N. & G. Taylor Co., manufacturers of tin plate in Philadelphia. Mr. Taylor said that although his firm had been dealing in tin plate for more than 35 years, it did not manufacture it until the tariff went into effect in 1890. Before that time its goods were manufactured in Wales. His firm did not make black plates, but intended soon to do so. The black plates manufactured in America, according to the witness, are superior to those made abroad. Prices are no higher now than they were six years ago, and wages in the tin plate industry generally are good. The N. & G. Taylor Co., the witness said, was a competitor of the American Tin Plate Co. He found no disposition on the part of the latter company to take advantage of its position by putting up prices unduly.

The American Pig Iron Storage Warrant Co.'s yards are now practically bare. On Dec. 10 the amount in yard was 5,900 tons, 3,600 tons having been withdrawn in the preceding 10 days and only 200 tons put in yard.

Assistant State Geologist Bain, of Iowa, confirms the report concerning iron ore in Allamakee county of that State and says that the deposits have been known for some time. The ore is limonite and for the most part is mixed with clay and other impurities. There are three points in the county named in which what is called "considerable bodies" of ore occur, but no estimates are given. These ores when washed carry from 54 to 60 per cent metallic iron and are high in phosphorus.

THE FORT PAYNE BOOM—REQUIESCAT.

To the Editor:

The announcement in your issue of Dec. 7, of the dismantling of the furnace at Fort Payne, Ala., and the removal of the open-hearth steel plant recalls some interesting data in respect to Fort Payne. It was essentially a boom town, and afforded from its very inception the finest illustrations of the insidious and powerful desire among a great many people to make a silk purse out of a sow's ear. As a site for the profitable manufacture of iron it never had anything to commend it except the limitless assurance of promoters. It had neither ore nor coal, the thin seams of Clinton ore lying to the eastward affording no foundation for the building up of a smelting business, while the less said about the coke, that carried from 20 to 30 per cent of ash, the better.

A noted mining engineer said to me several years ago that he had been employed to make a report on the resources of the region immediately contiguous to Fort Payne. He went down and spent some time there, reaching the conclusion that it would be very unwise to attempt to establish an iron industry there. But that was not the kind of report the promotors wanted. They made no use of it and he had to bring suit for his fee. A report "of a sort" was made by another engineer, and upon the basis of this the place was boomed for all it was worth. A carload or so of all kinds of material, ore, coal, coke, kaolin, building stones, woods, etc., was sent to Boston and handsomely mounted for exhibition. It was said at the time that some of the things sent did not come from that locality, but this may have been an oversight. When one is engaged in booming, the ordinary distinctions of honesty are liable to eclipse.

Fort Payne was a New England town, founded with New England money and modeled on the very latest New England pattern. A great many honest people in New England invested there and not a few came down themselves. It was a bustling place, with scarcely enough room on the sidings for the sleepers and excursion cars, with scanty accommodations and chairs at a premium. Everybody was to get rich off of everybody else, and into the wilds of De Kalb county the blessings of real New England doctrines were to penetrate. One of the chemists who furnished the analyses had a financial interest in the success of the enterprise and received a part of his pay in stock. At least this is what he told me, and I have no reason to doubt the accuracy of the statement. The analyses seemed to show pretty good stuff, and the stuff seemed to be pretty good—what there was of it; and plenty of it—such as it was. But now comes the end. When De Soto was camped at what is now Rome, Ga., in 1541, he sent an expedition into what is now De Kalb county, Ala. After some days it returned and reported that the country was mountainous. This was a true report, and it is to be regretted that old Garcelasso, the reporter for De Soto and the first war correspondent in the United States, had not lived until 1890.

Wm. B. Phillips.

Pittsburg, Pa.

It is reported that officers of the American Tin Plate Co. contemplate the erection of a large modern plant in the Central West. Some investigation is reported to have been made in the Mahoning and Shenango valleys and in the Pittsburg district in the search for eligible sites.

INDUSTRIAL SUMMARY.

If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

Dickson & James, Darlington, S. C., want a second-hand lathe, 20 or 22-inch swing, about 14 or 16-inch bed, screw-cutting, with countershaft and pulley.

Southern Iron Works, Tampa, Fla., are in the market for a pipe and bolt-threading machine; also planer and lathe.

The City Forge & Iron Works, Dayton, O., Andrew Plocher, proprietor, will buy a hand punch for work on scrolls for ornamental iron work. An improved tool desired.

At Birmingham, Ala., it is proposed to form a company for the manufacture of bolts, nuts, rivets, washers and railroad spikes.

At Louisville, Ky., Benj. Howe, Richard M. Houser and William M. Houser have incorporated the Houser Bros. Brass Mfg. Co., with capital stock of $10,000, to manufacture brass and other metallic articles.

John G. Sanders, Monroe, La., wants to buy a hydraulic wheel press; second-hand preferred.

Barrow & Yarboro, Louisburg, N. C., are in the market for a 50 h. p. boiler and a 40 h. p. engine.

W. A. Jones Foundry & Machine Co., 55 to 59 S. Jefferson st., Chicago, manufacturer of power transmission machinery, is in the market for an 8, 10 or 12-foot boring and turning mill.

The Central Steel Co., Indianapolis, Ind., capital $240,000, has been incorporated to take over and operate the Premier Steel Works, at Indianapolis. The following officers were elected: President, Major Collins, Brazil, Ind.; vice-president, W. J. Carlin, Pittsburg; treasurer, Crawford Fairbanks, Terre Haute, Ind.; secretary, Joseph R. Paull, Pittsburg. The report that a tin plate plant would be erected is untrue.

The Solid Steel Tool Co., Chicago, capital $5,000, has been incorporated to manufacture iron and steel by Henderson H. Miner, Walter D. Laparle, Carl Carlsen.

The Indiana Chain Co., of Indianapolis, has been incorporated with $50,000 capital by Frank W. Wood, Chas. C. Shumaker and Delbert S. Bray.

New Construction:—

The Thew Automatic Shovel Co., of Lorain, O., is pushing construction work on its plant. The structural steel is erected, the brick walls nearly completed and the roof is now being put on. All machinery is on the ground, the boiler, engine and generator set and the line shafting will be in place this week. An electric crane is to be installed.

It is stated that the Virginia Iron, Coal & Coke Co.'s steel plant, Middlesborough, Ky., will resume early in the year.

Work on the foundry at Grand Island, Neb., to replace the one recently destroyed by fire has begun. It will be a brick structure.

William Sellers & Co., of Philadelphia, are erecting a boiler house, 36x43 feet.

The Globe Iron Works, of Minneapolis, Minn., has begun work on a frame addition to its gasoline engine factory. It will be 44x100.

The Schuylkill Iron & Steel Co., of Philadelphia, has awarded the contract for the foundations for a large foundry which will be erected at Thirtieth st. and Gray's Ferry ave.

The Bullock Electric Mfg. Co., of Cincinnati, is advertising for bids to extend its main building 200 feet. This will make the main machine shop 500 feet by 101 feet. The heavy volume of business from all parts of the world in the last six months, has made it imperative that this extension be made with all possible haste.

The Sperry Trolley Wheel Co. has been formed at Cincinnati, O., for the purpose of manufacturing a patent trolley wheel. The company will begin operations at once, and a plant will be secured as soon as the location can be decided upon.

The Hallman foundry, at Mont Clare, Pa., will be enlarged, an addition 75x25 feet having been contracted for.

The Keasby & Mattison Co. of Ambler, Pa., is about to erect a large brick and iron building at Maple and Chestnut sts., Philadelphia. It will be 60x300 feet, one story, and will cost $50,000.

The Metal Goods Mfg. Co., Hamilton st., Cleveland, is erecting a $12,000 factory building.

The Tyler Wire Works Co., of Cleveland, is erecting a foundry to cost $9,000.

The Jones National Fence Co., of Columbus, is reported to have in contemplation a plant to supply its wire. The site spoken of is adjoining that of the new Columbus Steel & Iron Co.

The Champion Iron & Steel Co., Grand Rapids, Mich., has secured the use of a portion of a street for one of the buildings of its tin plate plant now going up. Permission was given the Chicago, West Michigan railroad to lay four tracks to the plant.

Announcement is made at Milwaukee of extensive contemplated improvements at the Illinois Steel Co.'s plant. New blast furnaces, new steel works and new rolling mills are planned, requiring two years for their erection.

At the Craig shipyard at Toledo, O., a large machine shop is under erection, and the manufacture of marine engines will begin in January.

The contract for the shell of the new furnace of the Warwick Iron & Steel Co., Pottstown, Pa., for the four stoves 100 feet high and 22 feet in diameter, and for the draught stack 220 feet high, has been let to William B. Pollock & Co., of Youngstown, O.

The Michigan Heater Co. has sold its recently constructed plant to the Detroit Galvanizing & Sheet Metal Works for about $25,000. The Michigan Heater Co. has bought a new site and will erect buildings at a cost of $20,000.

The Ohio Steel Mfg. Co., lately organized at Canton, O., has contracted with the Canton Bridge Co. for its buildings. An open-hearth furnace will be built.

Fires and Accidents:—

The machine shop, pattern shop and office building of the Palmers & DeMooy Foundry, Cleveland, burned Dec. 12, with loss of $13,000.

The Pittsburg District:—

C. J. Kane, of Buffalo, N. Y., and a number of Pittsburgers, have purchased the plant of the Portland (Me.) Rolling Mill Co., and will remove the machinery to a site on the Monongahela River not yet selected. A company with $250,000 capital stock is to be organized. The plant at Portland consists of four double puddling furnaces, a 10-inch guide, an 18-inch bar and an 18 inch muck mill, and furnaces. It will be set up to manufacture bar iron.

The Riter-Conley Mfg. Co., Pittsburg, has a contract from the American Steel & Wire Co. to erect an additional blast furnace, which will probably be built on Neville Island, below Pittsburg.

Singer, Nimick & Co., Pittsburg, are building a 36-pot crucible steel melting furnace.

The Pittsburg Stove & Range Co. has declared its first quarterly dividend of 1¼ per cent, payable Dec. 28.

Active work has been commenced on the foundations of the open-hearth addition at the Duquesne steel works of the Carnegie Steel Co., Ltd. The excavations are nearly completed.

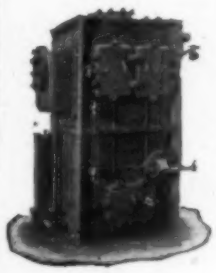
The Secretary of War has granted a permit to the Carnegie Steel Co. to erect a masonry intake, within the harbor lines, at the Carrie furnaces at Rankin. Permission is also given to erect a cofferdam, outside the harbor lines, to be removed within six months. The river will be dredged to a depth of 10 feet at pool stage for the intake.

Application will shortly be made for the incorporation of the Columbia Iron & Steel Foundry Co., by C. C. Lee, C. W. Robb, George P. Loomis, W. R. Brown, and S. McCrum. A plot of ground has been secured between 34th and 35th sts., Pittsburg, fronting the Allegheny Valley railroad. The plant to be built will manufacture both iron and steel castings.

Thomas Carlin's Sons have purchased a plot of ground on Kilbuck st., Allegheny, Pa., 150x485 feet, and will erect thereon a machine shop. The land is stated to have cost $23,000.

It is stated that the National Steel Co. has secured 3,000

WHEN BUYING FEED-WATER HEATERS.



A COCHRANE.

When a man wants to buy a Feed-Water Heater, he either carefully investigates all the different appliances that are presented for his consideration, or else he is convinced by his previous experience. It is safe enough to buy the same kind that was used before, but something better may have come into general use since the previous purchase, or the last investigation. While there are hundreds of thousands of horse power of COCHRANE HEATERS in successful, satisfactory service, there are, we suppose, thousands of steam users and engineers who are not acquainted with these appliances, or what they will do.

We will be very glad to have the opportunity of submitting full information, because these "COCHRANES" represent the highest development (along common-sense, practical lines) of appliances for fully utilizing the heat in exhaust steam for heating water and for purifying it, whether for boiler feed or other purposes. All the little "kinks" of design and construction that will make a Heater more durable, more reliable, more automatic and easier to clean, suggested or brought out by some 14 or 15 years' experience in this particular line, will be found in the "COCHRANES" *There is full warrant for every claim we make. Our COCHRANE HEATERS do precisely what we say they will.* Inquiries solicited.

HARRISON SAFETY BOILER WORKS,

Clearfield & 17th Sts. PHILADELPHIA, PA.

acres of the best tin-vein coal in the Pittsburg district. The land lies between Bridgeville and Canonsburg, and is reached by the Chartiers railway, a branch of the Pan Handle, and by the Pittsburg, Chartiers & Youghiogheny railroad.

The heads of the traffic department of the Pittsburg Coal Co. have now all been selected. They are: H. J. Lawrence, traffic manager; C. L. Porter, formerly with Osborne, Saeger & Co., superintendent of transportation; J. L. Simons, formerly assistant master car builder of the Pittsburg & Lake Erie Railroad, superintendent of rolling stock and machinery; J. L. O'Toole, formerly chief clerk in the accounting department of the Pittsburg & Lake Erie railroad, car accountant.

The new plant of the Seamless Tube Co., at Ellwood City, Pa., is nearing completion, and will be ready for operation by Jan. 1. The engines and boilers are in place, and a number of special tools are being installed.

Ex-Gov. James A. Beaver, of Pennsylvania; State Senato N. E. Whitaker and Messrs. W. E. Tustin, W. H. Rogers and A. B. Dally, Jr., a majority of the incorporators of the National Tin Plate Co., have called a meeting of the stockholders, to be held in Pittsburg, Dec. 28, for the purpose of organizing. This is the company controlling the Rogers process of tin plate manufacture.

Judge Putnam, of the United States Circuit Court, in the case of the Duff Mfg. Co. vs. Norton at final hearing again sustained the Barrett lifting jack patent 455,993, of July 14, 1891, as valid and infringed by Arthur O. Norton, of Boston. He ordered the preliminary injunction granted last spring against Norton made perpetual. In so doing the court followed the several decisions made at Pittsburg, Philadelphia and Kalamazoo.

Chicago District and Northwest:—

It is reported that the Illinois Car & Equipment Co. will extend its plant at Hegewisch, to include a department to be devoted to the manufacture of steel cars. The reconstruction of that part of the plant which was destroyed by fire recently is going ahead rapidly.

Marinette Iron Works Mfg. Co., Marinette, Wis., was recently organized and incorporated under the laws of Wisconsin with a capital stock of $75,000, with the following officers elected: T. C. Miller, president; S. P. Colby, vice-president; H .L. Prescott, secretary; H. H. Norris, treasurer. In addition to the manufacture of the Walrath gas engines and wagon skeins, the company is carrying on a general foundry and machine business, particularly building saw mill and mining machinery.

The Chicago machinery market is reported more than ususally active. Electrical machinery is in great demand, while manuacturers of large mchinery and that used for mining report an unusual activity. In smaller engines and machinery the manufacturers are apace with their orders, but the available supply is nowhere near the usual accumulation at this period of the year.

The J. G. Wagner Co., Milwaukee, Wis., will erect a large foundry to cost about $60,000, to replace smaller one recently burned. It will also enlarge the structural iron department of its plant. The company has a contract for $380,000 worth of iron for the new Chicago post office building and also an order for iron work for the new Portland, Ore., Federal building, amounting to about $82,000.

J. B. Doan & Co., of Chicago, have received the contract for the machine tool equipment for the United States refrigerating and ice making plant now being erected in Manila. P. I. The outfit consists of lathes, shapers, drills, etc.

W. C. Heimbuecher, 36 La Salle st., Chicago, selling agent for iron and steel products, reports that for the last 30 days business has been very good. He has just returned from an extended trip along the Mississippi River and finds that all the jobbers have pretty well covered themselves on all lines of goods to carry them far into next year and they apparently have anticipated their wants so far ahead that business from them will not be rushing as all have taken advantage of the low prices to cover themselves far beyond what they would do under usual conditions. Further, they are getting ready to take inventory which is usually the case in the last week of the year. Mr. Heimbuecher is pushing the sale of the Detroit Twist Drill Co.'s twist drills, especially the groove shank drills. Large manufacturers have adopted them on account of the quick adjustment and labor saving chucks used on them, which are commended because there are no set screws to catch into the clothes of the workmen.

A. M. Castle & Co., of Chicago, dealers in iron and steel, and in railway and boiler makers' supplies, announce the removal of their office and warehouse to 54-60 South Canal st., and 55-59 West Water st. Direct connection is made with the Pennsylvania, Pan Handle and C. M. & St. P. lines. The new warehouses are particularly advanatageous in location and give room for carrying large stocks of the boiler specialties manufactured by the firm, including patent pressed steel boiler lugs, hangers, saddles, manhole plates, crabs, bolts, flanges and copper ferrules, and Huston patent boiler braces. A complete stock is carried of the Champion Rivet Co.'s Victor boiler rivets from ½-inch to 1½-inch diameter; also of charcoal iron lap-welded iron boiler tubes for locomotives, marine and stationary boilers, and merchant steel lap-welded boiler tubes. The firm is in position to make exceptionally prompt shipments on plate steel from the Lukens Iron & Steel Co., Coatesville, Pa., and is prepared to furnish plates from No. 10 gauge to 2 inches thick up to 10 feet wide. A complete line of pneumatic hammers, riveters and drills is carried.

General Industrial Notes:—

An adjustment has been made between the Republic Iron & Steel Co., which has 11 plants in Indiana, and that State whereby the company agrees to pay its employes 28 times each year instead of 24 and not hold back more than seven days' pay at any time. The last legislature passed a law compelling weekly payment of wages, and representatives of the company are quoted as saying that weekly payment of wages would cost them from $100,000 to $200,000 a year. The law provides that when a certain per cent of the employes agree bi-weekly payments may be made.

The East Radford, Va., furnace of the Virginia Iron, Coal & Coke Co. was put in blast Dec. 5.

The Whiteley Steel Co., of Muncie, Ind., has secured the

Our No. 1 Shop Saw.

Shop Saws

equipped with automatic or gravity feed for cutting tool steel and all softer metals.

MADE IN FOUR STYLES.

If you need a cheap saw of small capacity write us.

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contract for furnishing the steel header castings that go into the boilers of the new battleship Maine, and United States monitor Connecticut.

The prospects are that the Riverside plant of the American Tin Plate Co., at Cincinnati, will not resume work this winter.

At New Castle, Pa., the rod wire and nail mills, idle the past summer, are to be started up early in the new year, it is reported. The steel plant of the National Steel Co. is closed down for extensive improvements.

It is expected that Jupiter Furnace, at St. Louis, inactive for a number of years, will be started soon.

The Empire Steel & Iron Co., of Oxford, N. J., has secured the Fellows Railroad and the Paul A. Queen iron ore mines near Oxford, and will rebuild the railroad and work the mines.

The steel casting plant at Lima, O., which has been idle for many months, is being repaired and equipped for early resumption.

Last week the Hecula Furnace at Ironton, O., was put in blast after a shut down of six weeks, caused by scarcity of water.

The Southern Iron Works has been organized at Tampa, Fla. The company will enlarge its plant.

The Kansas City Car & Foundry Co.'s plant, recently bought in the interest of the Griffiin Wheel Co., will be made one of the largest car wheel foundries in the country. As soon as the inventory of the plant has been taken the foundry will begin turning out 250 cast chilled iron car wheels a day.

It is reported that 10,000 acres of magnetic iron ore land in Ashe County, North Carolina, have been leased by the Pennsylvania Steel Co., of Philadelphia.

The American Steel & Wire Co. has issued orders to remove the wire weaving machines from the McMullen Wire Co.'s plant at Evanston, Ill., to De Kalb, Ill.

The furnace at Gadsden, Ala., owned by the Alabama Consolidated Coal & Iron Co. will be ready for blast by Dec. 15. This company has already one furnace going at Ironaton, making 175 tons a day, and the work is being pushed to get the other Ironaton furnace going.

It is stated that the Gould steel casting works at Anderson, Ind., may be moved to Depew, N Y. The failure to obtain sufficient gas is announced as one reason for the change. These works make an improved car coupler.

The Sharon Steel Co. has awarded a contract to Russell & Co., of Massillon, O., for two 600 h. p. cross compound engines, for operating the electrical generators. One of the engines is to be completed in five months and the other in ten months.

Transfers of coal and iron property to new hands have been signed in New York. Fred. C. Dunn, of Chicago, carried the negotiations through. The properties are said to be those of the Woodstock Iron Co., consisting of two blast furnaces, 46,000 acres of iron and coal lands, the adjacent lands of the Gurnee Land Co., 20,000 acres; furnaces, etc., in Anniston, Ala., and the Aetna Coal Co.'s plant of coke ovens, 18,000 acres of coal lands, etc., in Tennessee.

The Aultman & Taylor Mfg. Co., Mansfield, O., has been going night and day for seven months and is so far behind in the delivery of its orders for Cahall and B & W. boilers that large extensions of the plant have been determined upon. For the year ending Oct. 1 the boiler sales have aggregated 250,000 h. p., which represents a value of $4,000,000. The company will manufacture the 39,000 h. p. boiler recently ordered of Thayer & Co., of New York, for the New York Gas, Light, Heat & Power Co.'s new plant. Foreign orders have also been quite numerous lately, showing an increase of quite 150 per cent over last year.

Low Holiday Rates via C. T. & V. R. R.

Tickets on sale Dec. 23, 24, 25, 30, 31, 1899, and Jan. 1st, 1900; good returning to and including Jan. 2nd, 1900. For particulars call on C. T. & V. agents, or address, J. E. Galbraith, Traffic Manager, Cleveland, O.

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WATTS. We print the name large for we want every consumer of foundry iron to see it. **WATTS.**

Those who have tried Watts know its merits. It is strong, soft and tough. Can be melted alone, mixed with other brands, or used as a scrap carrier.

The Watts furnaces are sold up for this year, but can take care of a limited number of orders for delivery beginning in January. Let us know how much you need and we shall make you the most favorable prices.

Rogers, Brown & Co.

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Buffalo.
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METHOD OF CASE-HARDENING.*

BY JOHN BUCKLEY, OF CHICAGO.

The process of case-hardening has not changed materially for the past few years. The principal materials used remain the same: Granulated rawbone, hydro-carbonated bone black, black oxide of magnesia, sal soda, charcoal and salt. These materials are commonly used in railroad shops and give much satisfaction if they are carefully and properly handled.

For pins and bushings, and such light work as is required for immediate use, we use the New York specialty case-hardening powder; this we found to be greatly superior to potash.

The work which is to be hardened can be packed in cast or wrought iron boxes, sealing with fire clay or mud, so as to prevent the gases from escaping as much as possible. The pieces to be hardened should be placed about two inches apart in the box. The vacant spaces are well filled and packed with the material you are using for case-hardening purposes. Should your box be supplied with heavy work, as crank pins, guides, etc., 15 to 20 hours of steady heat is necessary in order to secure best results. If, on the other hand, you have light pieces, as links, link blocks and pins, eight to 10 hours will be sufficient to subject them to a good heat.

This class of work we place in the furnace about 8 o'clock in the morning and heat it all day. At night we close up the furnace, letting the box remain over night and remove next morning. Reheat this work and cool in cold water. We have secured good results using granulated rawbone. If using hydro carbonated bone black, pack the pieces in a box and seal as before.

Furnaces for case-hardening should be so constructed that the boxes will not have to be raised or lowered while being put into or taken from the furnace. The heating space is near the ground. The fire box and ash pan are below the surface. This refers to a furnace heated with soft coal. If the furnace is outside of the building, a stack or chimney, about 16 feet high, will furnish draft enough to heat the boxes without aid of a blast. Case-hardening furnaces which

*A paper read before the National Railroad Master Blacksmiths' Association.

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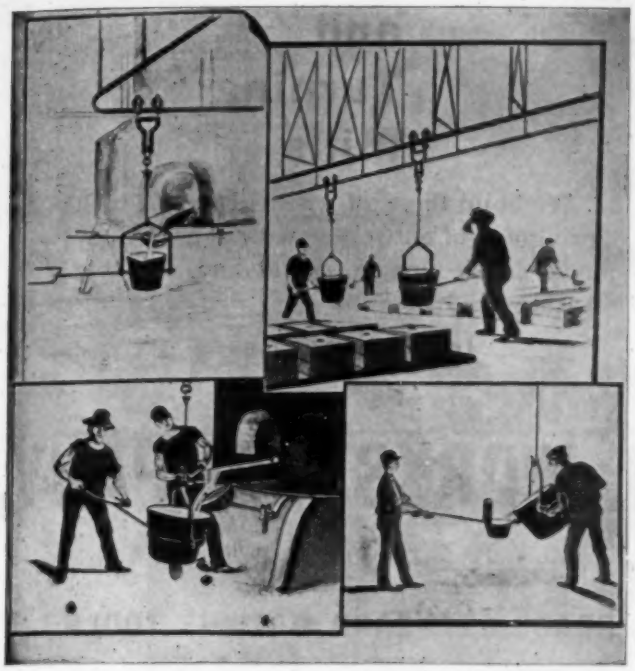

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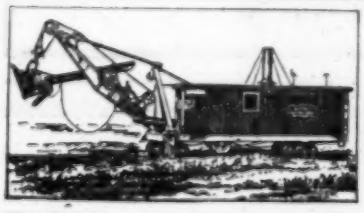

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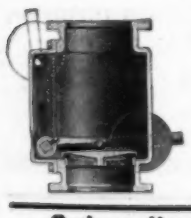

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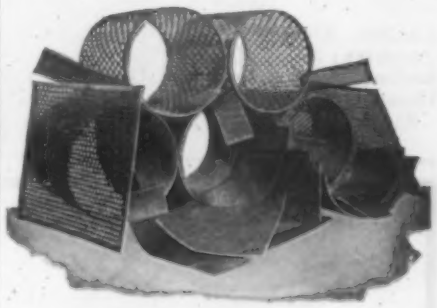

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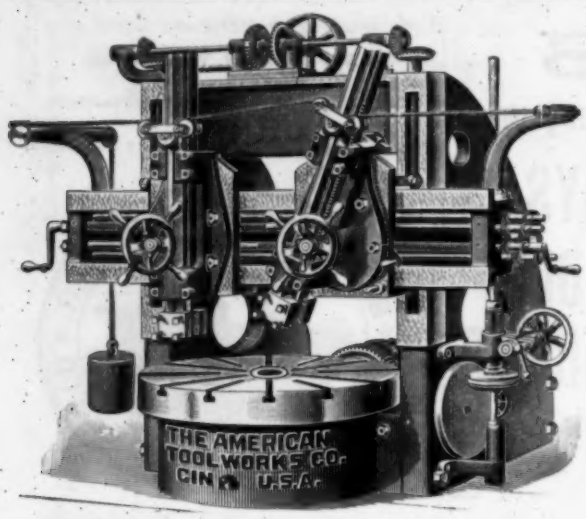

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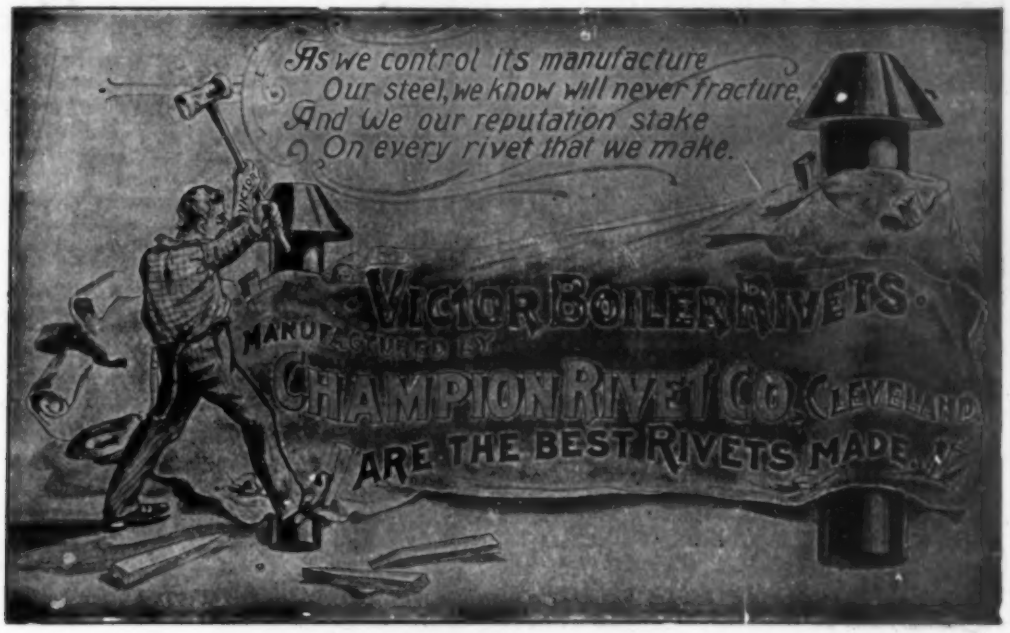
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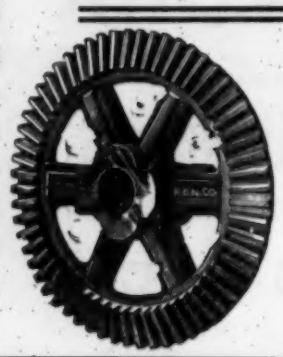

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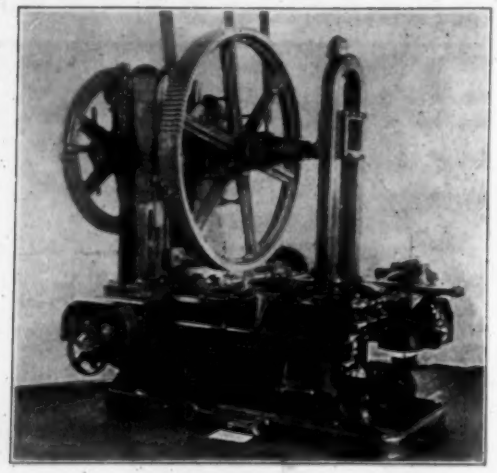

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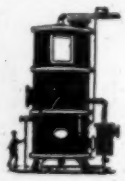

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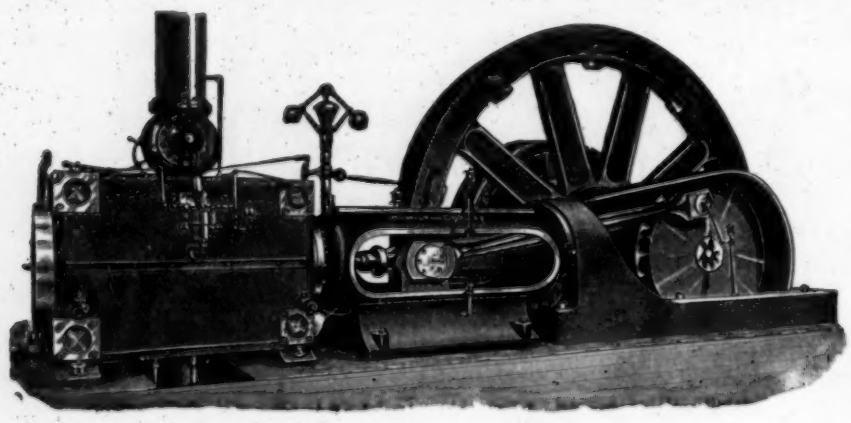

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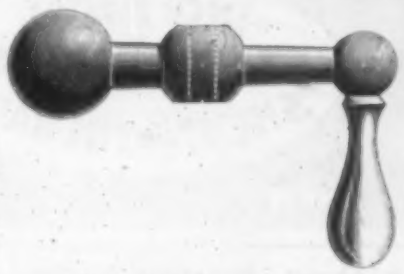

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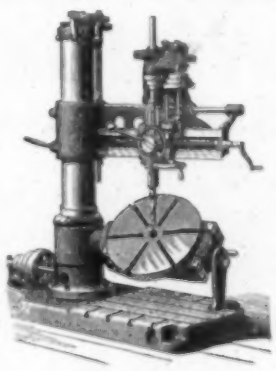

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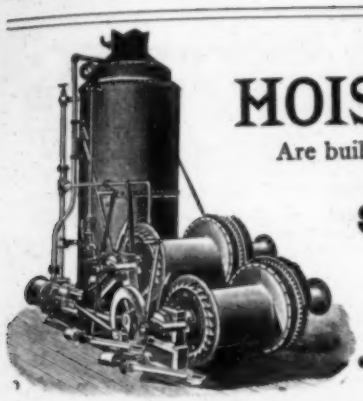

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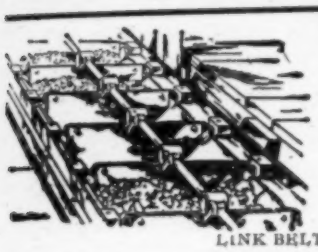

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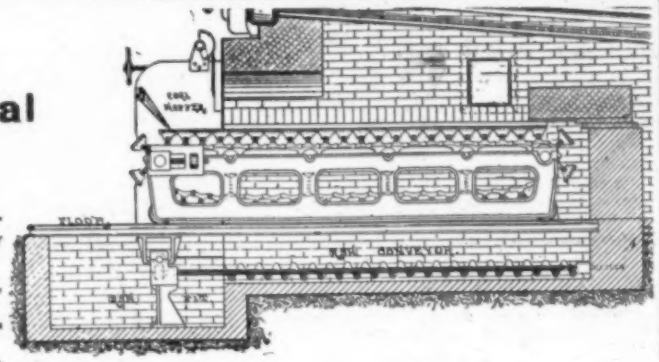

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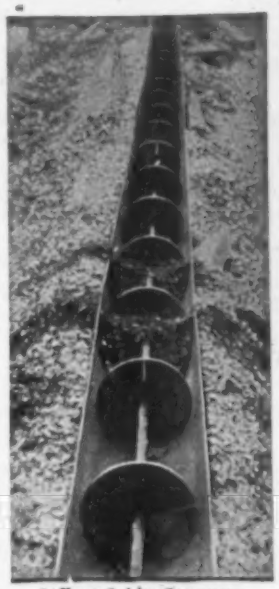

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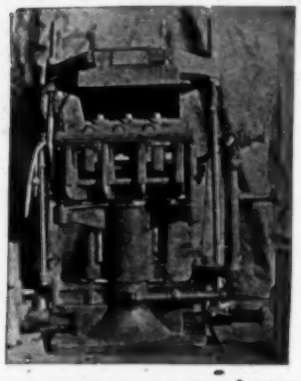

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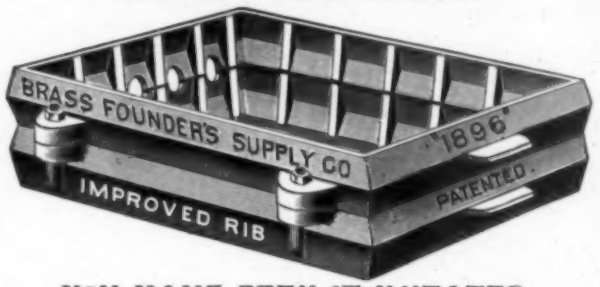

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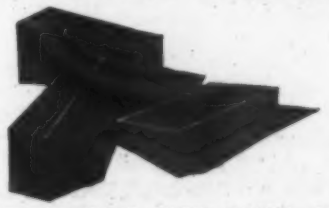

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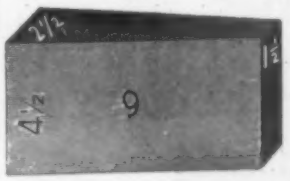

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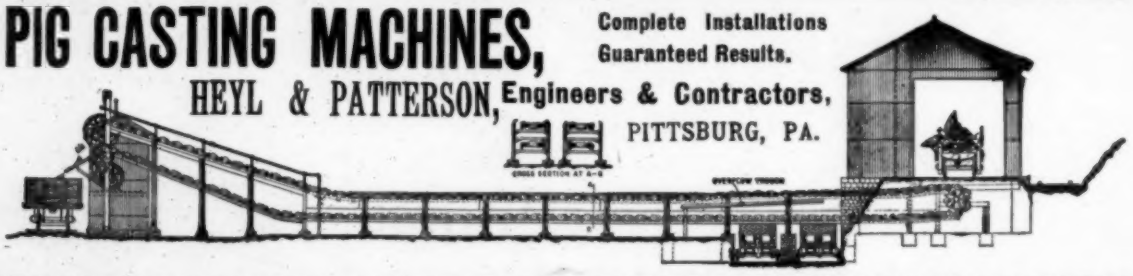

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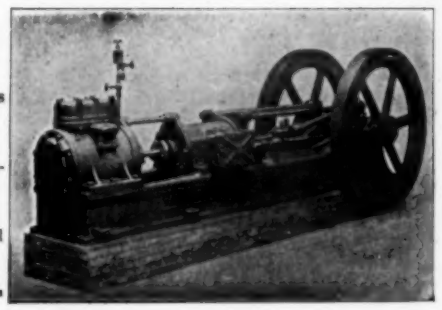

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A going plant of fifty-three ovens, with all equipments necessary to its complete operation. Ground has been prepared for one hundred additional ovens.

The property consists of 625 acres, of which 225 acres include the surface, dwelling houses, etc.

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200 to 300 tons new 10-inch standard iron pipe, 40 lbs. per foot, not threaded, at $50.00 net ton, f. o. b. cars Cleveland, O. Subject to inspection. Also about 15 tons Flanged Steel Plates, 3/8-inch to 1-1/4-inch thick—further specifications furnished on application; and 100 tons 5-16-inch Iron Plates, 35 inches wide x 20 feet long. Also some second-hand 20-lb and 30-lb relaying rails with angle-ba s.

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CLEVELAND AXLE MFG. CO.,
Canton, O.

ESTABLISHED 1854.

Cleveland, Lorain & Wheeling,

Railroad Company.

Time Table effective May 15th, 1898.

Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.		North Bound.		
15	13	11	Lorain Branch	12	14	16	
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.	
4:25	2:25	6:27	Lorain	9:15	11:35	7:30	
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16	
4:56	2:55	7:04	Grafton	8:43	11:07	6:58	
5:15	3:12	7:23	Lester.....	8:25	10:50	6:40	
5	3	1	Main Line	2	4	6	
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15	
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01	
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19	
6:52	3:35	8:30	Medina	7:16	10:37	6:07	
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55	
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40	
8:09	4:46	9:45	Massillon	6:00	9:23	4:54	
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10	
9:02	5:38	10:41	New Philade	5:04	8:28	4:03	
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45	
.....	8:10	1:30	Bridgeport ...	.....	6:05	1:40	
.....	8:25	.....	Bellaire.....	.....	5:50	.....	
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.	

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

Trains 1, 2, 5 and 6 daily between Cleveland and Urichsville. All other trains daily except Sundays. Electric cars between Bridgeport and Wheeling, and Bridgeport and Martins Ferry and Bellaire. Consult agents for general information as to the best routes and passenger rates to all points. M. G. CARREL, G. P. A.,

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Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

DIRECTORY

To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States.

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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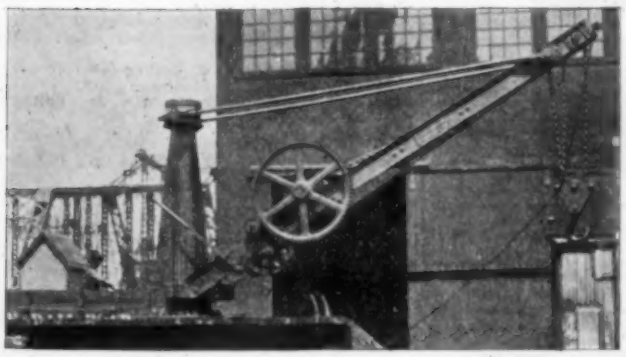
CRANES



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No. 1 Specular, non-Bessemer	4.50@ 4.75
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SECOND EDITION

CREMER & BICKNELL'S

Chemical and Metallurgical

HANDBOOK

EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

Numerous miscellaneous tables have been added, which, it is hoped, will be found of value

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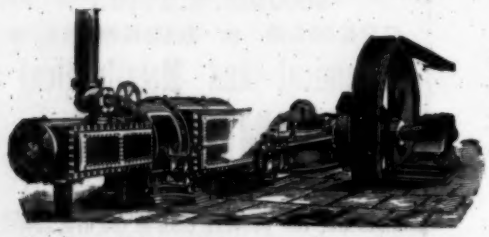

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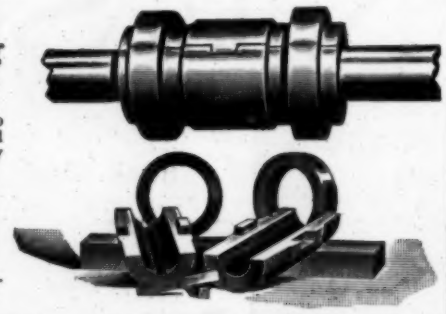

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CASTINGS (BRASS)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co Lorain. O.

CASTINGS (BRONZE)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

CASTINGS (MALLEABLE)—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit Mich.
Forster, Waterbury & Co , Chicago, Ill.

CEMENT—
The Brier Hill Iron & Coal Co., Youngstown, O.
Garden City Sand Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.

CHAIN HOISTS—
Reading Crane & Hoist Works, Reading, Pa.

CHAIN BELTING—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
Buhl Malleable Co., Detroit, Mich.

CHANNELERS—
The Ingersoll-Sergeant Drill Co., New York.

CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.
Cremer & Bicknell, Cleveland, O.
We Fu Go Co. Cincinnati, O.

CHILLED AND SAND ROLLS—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Riverside Foundry Co., Cleveland, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips Sons' Co., Philadelphia, Pa.
Lorain Foundry Co., Lorain, O.

CHUCKS—
Skinner Chuck Co., New Britain, Conn.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

COAL SCREENS—
Hendrick Mfg. Co., Carbondale, Pa.
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

COAL AND COKE—
M. A. Hanna & Co., Cleveland, O.
Rogers, Brown & Co., Cincinnati, O
Reed F. Blair & Co., Pittsburg, Pa.
Forster, Waterbury & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Washington Coal and Coke Co., Pittsburg, Pa.
Pickands, Mather & Co., Cleveland, O.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster Camp & Lane Machine Co., Akron, O

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago, Ill.
American Pneumatic Tool Co., New York City.
Manning, Maxwell & Moore, New York City.
W. J. Schaefer & Co., New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

CONTRACTORS FOR CLEANING BOILERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.

CORE OVENS—
Millett Core Oven Co., Brightwood, Mass.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES—
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Excelsior Iron Works Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Crane & Car Co., Cleveland, O.

CRANK HANDLES—
Norwood Bicycle Co., Cincinnati, O.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co , Harvey, Ill.

DIES—
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Manning, Maxwell & Moore, New York City.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.

DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield, Mass.

DROP PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATORS—
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O
Buhl Malleable Co., Detroit, Mich.
Excelsior Iron Works Co., Cleveland, O.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co., Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J Wendell Cole, M.E., Columbus, O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
Wellman-Seaver Engineering Co., Cleveland, O
Walter Kennedy, Pittsburg, Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Geo. B.. Sennett Co., Youngstown, Ohio.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill,

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. P. Smith & Co., New Brighton, Pa.
Chas Taylor's Sons Co. Cincinnati, O.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Excelsior Iron Works Co., Cleveland, O.
Macbeth & Co., Cleveland, O.

FOUNDRY EQUIPMENT.
Miller & Hays, Akron, O.
Tabor Mfg. Co., Elizabeth, N. J.
Millett Core Oven Co., Brightwood, Mass.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Miller & Hays, Akron, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. P. Smith & Co., New Brighton, Pa.

Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

FRICTION METAL—
James B. Clow & Sons, Chicago, Ill.
Theo. Hierts & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Magnolia Metal Co., New York City.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FURNACE, MELTING—
Whiting Foundry Equipment Co., Harvey, Ill.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Q & C Co., Chicago, Ill.

HANDLES—
Norwood Bicycle Co., Cincinnati, O.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEAVY HARDWARE—
C. H. Besly & Co , Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O.

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

IRON BUILDINGS—
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
R. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.
L. K. Hirsch, Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport O
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland. O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago. Ill.
U. Baird Machinery Co., Pittsburg. Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield, Mass
W. P. Davis Machine Co., Rochester, N. Y.
Manning, Maxwell & Moore, New York City.
Bertsch & Co., Cambridge City, Ind.
Skinner Chuck Co., New Britain, Conn.

LADLES—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg. Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LOCOMOTIVES—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

MALLEABLE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.
Forster, Waterbury & Co., Chicago, Ill.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
Theo. Hierts & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelshia, Pa.
Magnolia Metal Co., New York City.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL WORK—
Avery Stamping Co , Cleveland, O.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.
Whiting Foundry Equipment Co., Harvey, Ill.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland. O.
Forsythe Pattern Works, Youngstown, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa.
G. H. Ginther, Special Agent, Pittsburg, Pa.

PIPE (CAST IRON)—
James B. Clow & Sons, Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons, Pittsburg, Pa.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.

PIPE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago, Ill.
W. J. Schaefer & Co., New York City.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.

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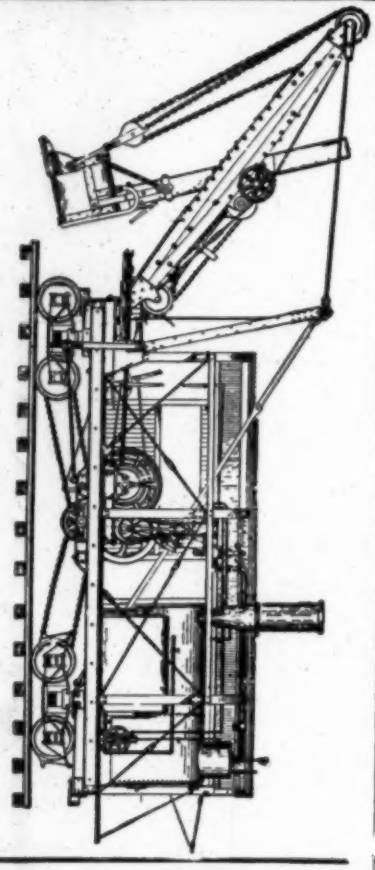

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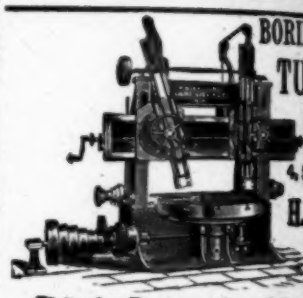

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